COMMERCIAL FISHERIES Review

VOL. 31, NO. 11 NOVEMBER 1969

DEC 9 1969
MUSEUM LIBRARY

COVER: This giant, 25-pound, lobster was caught in the offshore waters of New England. BCF biologists are studying the lobster fishery to determine if the offshore and inshore fisheries compete for same supply of lobsters. In any case, the fishery must be managed properly to insure a continuing source.

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

Fishermen's Memorial
Gloucester, Mass.

Managing Editor: Edward Edelsberg
Associate Editor: Barbara Lundy

Production: Jean Zalevsky
Alma Greene
Mary Andrews

The Bureau of Commercial Fisheries and
The Bureau of Sport Fisheries and Wildlife
make up The Fish and Wildlife Service of
The United States Department of the Interior.

Throughout this book, the initials BCF stand
for the Bureau of Commercial Fisheries.

Address correspondence and requests to: Commercial Fisheries Review, 1801 North Moore Street, Room 200, Arlington, Va. 22209. Telephone: Area Code 703 - 557-4246.

Publication of material from sources outside the Bureau is not an endorsement. The Bureau is not responsible for the accuracy of facts, views, or opinions of these sources.

Although the contents have not been copyrighted and may be reprinted freely, reference to source is appreciated.

Use of funds for printing this publication was approved by the Director, Bureau of the Budget, April 18, 1968.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.
Price 60 cents (single copy). Subscription Price: $7.00 a year; $2 additional for foreign mailing.

CONTENTS

	Page
UNITED STATES	
Events and Trends	1
States	19
ARTICLES	
A Trawler's Voyage Points Up U.S. Fishermen's Problems, by Elliot Carlson	24
Tuna Purse Seine Fishery in Eastern Tropical Atlantic, by John P. Wise	27
Fishery Oceanography--IV, Ocean Salinity and Distribution of Pacific Salmon, by Felix Favorite	29
Tropical Atlantic Tuna Larvae Collected During EQUALANT Surveys, by William J. Richards	33
BOOKS	38
INTERNATIONAL	41
Canada	44
Europe	47
Latin America	53
Asia	57
South Pacific	65
Africa	66
INDEX	71

PROGRAM TO STRENGTHEN U.S. MARINE-SCIENCE ACTIVITIES IS ANNOUNCED

A 5-point program to strengthen U.S. marine-science activities was announced on October 19 by Vice President Spiro T. Agnew as Chairman of the National Council on Marine Resources and Engineering Development (NCMRED).

He said the Administration has selected 5 areas "for immediate special emphasis in the next fiscal year" while the Administration and Congress work out a long-term program.

Money will be provided to carry out the 5 programs. Each program will be assigned to an appropriate Federal agency while studies of the organization of U.S. marine-science activities continue.

The 5 priority programs were picked after an intensive Government-wide review of the Nation's urgent needs in marine affairs.

President Nixon requested the study in February after receiving the Report of the Commission on Marine Science, Engineering and Resources--"Our Nation and the Sea." (See CFR, Feb. 1969.)

I. COASTAL ZONE MANAGEMENT

A new U.S. policy will be fashioned "to promote the national development of coastal areas and the Great Lakes." A grant program will aid States to plan and manage coastal activities.

New legislation will help insure that rapid coastal development does not destroy limited land and water resources. All interests in the coastal regions would be assured consideration--"for port development, navigation, commercial fishing, mineral exploitation, recreation, conservation, industrial development, housing, power generation and waste disposal."

The Administration anticipates that grants will be given for these purposes: 1) development by States of planning and regulatory mechanisms; and 2) operation of these State management systems. The latter grants would be made if States demonstrate the capability to prepare plans that provide for:

- "balanced use of the coastal margin, both land and water, that considers viewpoints of all potential users";
- "access to management-oriented research, including coastal ecology studies";
- regulatory authority as needed--zoning, easement, license, or permit arrangements--to insure development consistent with State plans;
- "consideration of the interests of adjacent States";
- land acquisition and power of eminent domain when necessary to implement the plan; and
- review of proposed U.S., U.S.-assisted, State, and local projects to insure consistency with plans.

Mr. Agnew believes that this program should strengthen the capabilities of States to manage coastal resources, lessen the need for Federal intervention, and "facilitate integration of planning, conservation, and development programs among diverse public and private interests."

II. ESTABLISHMENT OF COASTAL LABORATORIES

Coastal laboratories will be set up, supported by the U.S. Government, "to provide information on resource development, water quality, and environmental factors to assist State authorities and others in coastal management."

Existing facilities will be strengthened in order to:

- develop basic understanding and to describe the ecology of the 13,000-mile coastline. Ecology--the interrelationship of organisms with their environment--differs with regions.

- anticipate and assess the impact on a region's ecology of alternative land uses, of pollution, and of changes in the land-water interfaces;

- operate coastal monitoring networks; and

- perform analyses needed for coastal management.

III. PILOT TECHNOLOGICAL STUDY OF LAKE RESTORATION

A pilot study of a lake will be carried out to determine the feasibility of restoring the Great Lakes with technological and regulatory mechanisms. Present environmental technology and techniques will be tested. These will include "pollution measuring devices, methods of artificial destratification by aeration, mixing and thermal upwelling techniques, thermal pollution control and enrichment, artificial bottom coating, filtering, harvesting of living plants and animals, and restocking of fishery resources." The program will reinforce investigations now underway. Specialists from industry, academic institutions, and Federal laboratories will add their skills to these studies.

IV. INTERNATIONAL DECADE OF OCEAN EXPLORATION

"The United States will propose a range of specific programs as its initial contribution to the International Decade of Ocean Exploration during the 1970s." The U.S. proposed the Decade, which was endorsed by the UN General Assembly in December 1968. Funds will be provided for the U.S. share.

The United States proposes international emphasis on these goals:

- Preserve the ocean environment by accelerating scientific observations of the ocean's natural state and its interactions with the coastal margin. This would be done to provide a basis for (a) assessing and predicting man-induced and natural modifications of

the oceans' character; (b) identifying damaging, or irreversible, effects of waste disposal at sea; and (c) understanding the interaction of levels of marine life to prevent depletion or extinction of valuable species as a result of man's activities.

• Improve environmental forecasting to reduce hazards to life and property--and permit more efficient use of marine resources. This would be achieved by improving physical and mathematical models of the ocean and atmosphere to provide basis for "increased accuracy, timeliness, and geographic precision of environmental forecasts."

• Expand seabed-assessment activities to permit better management--domestically and internationally--of ocean mineral exploration and exploitation. Acquisition of needed knowledge of "seabed topography, structure, physical and dynamic properties, and resource potential" would help to achieve these goals.

• Develop an ocean-monitoring system to make it easier to predict oceanographic and atmospheric conditions. The system could be developed through design and deployment of oceanographic data buoys and other remote sensing platforms.

• Improve worldwide data exchange by modernizing and standardizing U.S. and international marine data collection, processing, and distribution.

• Accelerate Decade planning so that there will be more international sharing of the scientific equipment, responsibilities, and costs of ocean exploration.

This U.S. contribution to an expanded program of intergovernmental cooperation reflects 4 recent developments:

(1) Greater population concentration along the coasts of the U.S. and other countries. This could harm the ocean environment and increase demands on coastal margins and marine resources.

(2) Growth of technology that is rapidly opening new ocean frontiers.

(3) Scientific advances that can improve environmental forecasts if better ocean data are available.

(4) 100 coastal nations are showing more interest in benefiting from marine activities.

The Decade will speed the needed understanding of the ocean. It will permit nations individually to plan investments and, collectively, to arrange for preserving the ocean environment and managing ocean resources.

The oceans are global. The scope of work to be done makes international cost sharing and data exchange very attractive. International cooperation in marine affairs may facilitate communication with developing nations, with the Soviet Union, and with others.

The National Council on Marine Resources and Engineering Development says the U.S. proposals are compatible with the ocean exploration program of UNESCO's Intergovernmental Oceanographic Commission. The U.S. contribution to this program will depend on the contribution of other nations.

V. ARCTIC ENVIRONMENTAL RESEARCH

Arctic research activities will be intensified. These will permit fuller utilization of the rapidly developing area. The research will insure that this use does not degrade, through neglect, the Arctic environment. It will accumulate knowledge on the interaction of man with the Arctic environment.

The program will be directed to: (1) the polar icepack to include its impact on transportation and global weather and climate; (2) the polar magnetic field and its effects on communication; (3) geological structures underlying the Arctic lands and polar seas--as potential mineral sites and as hazards to construction and resource development; (4) balance of the Arctic ecologic system; (5) the presence of permafrost; and (6) slow degradation of liquid and solid wastes under Arctic conditions. Behavior and physiology of man also will get more attention.

In the beginning, the emphasis will be on strengthening and broadening Arctic research capabilities. Formulation of an overall policy framework for Arctic-related activities also will be considered.

WENK COMMENTS ON 5-POINT PROGRAM

In a press conference preceding announcement of the 5-point program, Dr. Edward Wenk Jr., executive secretary of the National Council on Marine Resources and Engineering Development, said:

• "The states are pivotal to solving our coastal problem. We need the states to help us manage our ports, our fisheries, our waste disposal, conservation--you name it, they're all part of the same thing."

• The 13,000-mile coastline: "We want to know what's there, and then we want to find out what's happening to it."

• Pilot study of lake pollution: A lake of several hundred square miles would be polluted. Then an attempt would be made to clean it up by chemical, thermal, mechanical and biological means.

"This will be difficult," Dr. Wenk concluded, "but we have to start somewhere. These things can't wait."

• International Decade of Ocean Exploration: Some funds already have been authorized. More would be sought to increase research of the oceans to find out how man is polluting them and how he can reduce that pollution.

• Arctic: Intensify marine research in area where oil, gas, and mining exploration is increasing--and where pollution is special problem because of intense cold.

The National Council

The National Council on Marine Resources and Engineering Development was established by Public Law 89-454 to assist the President in developing and coordinating national marine-science policies and programs. The members are:

Chairman:

Spiro T. Agnew, the Vice President

Members:

William P. Rogers, the Secretary of State

John H. Chafee, the Secretary of the Navy

Walter J. Hickel, the Secretary of the Interior

Maurice H. Stans, the Secretary of Commerce

Robert H. Finch, the Secretary of Health, Education, and Welfare

John A. Volpe, the Secretary of Transportation

Glenn T. Seaborg, Chairman, Atomic Energy Commission

William D. McElroy, Director, National Science Foundation

Observers:

Lee A. DuBridge, Director, Office of Science and Technology

Robert P. Mayo, Director, Bureau of the Budget

Paul W. McCracken, Chairman, Council of Economic Advisors

Thomas O. Paine, Administrator, National Aeronautics and Space Administration

John A. Hannah, Administrator, Agency for International Development

S. Dillon Ripley, Secretary, Smithsonian Institution

Executive Secretary:

Edward Wenk Jr.

UNITED STATES

HICKEL URGES WORLD ACTION TO PROTECT & DEVELOP ARCTIC RESOURCES

A 3-day Polar Plan Conference on Arctic problems ended in Shenandoah National Park, Va., on Oct. 1 with a request by Secretary of the Interior Walter J. Hickel that future Arctic plans be viewed from an international standpoint.

He said: "Knowledge of the world's polar regions will change not only the countries bordering on the Arctic--it will change economic, social and cultural conditions throughout the world. I urge you to think of the Arctic as a single entity, so that all nations can contribute to its conservation and the wise use of its resources.

"The North Country is beginning to undergo the most rapid and profound changes ever seen in any wilderness region in world history. It is unlike any other region in the world in many other ways.

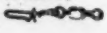
"All of us--throughout the world--who work with the Arctic must find new ways to meet this unprecedented challenge. We need new ideas, new techniques and attitudes, perhaps even new institutions, and we need them in every nation involved in the Arctic."

Involve Alaska's Natives

Secretary Hickel urged that Alaska's native Indians, Eskimos, and Aleuts be given every opportunity to take part in decisions involving the Arctic and the work now being undertaken by industry and government.

Unlike most other workers, he noted, Alaska Natives are accustomed to the land and its climate. Their rate of turnover on the job can be expected to remain low. Their keen personal interest in preserving their environment makes them most likely to respect it and work in harmony with it as much as possible. He emphasized that human values must be given paramount attention. All developmental problems must be considered in terms of their effects on people.

The Conference was attended by 100 representatives of industry, science, conservation, and government to exchange ideas about the North's spectacular boom. Canada and Norway sent high officials.



INTERIOR DEPARTMENT LIMITS FISHERY LOANS TO $40,000

High interest rates charged by commercial lending institutions have led to an unprecedented demand for fishery loans from the Bureau of Commercial Fisheries. This has required BCF to limit such loans to $40,000 per transaction.

Dr. Leslie L. Glasgow, Assistant Secretary of the Interior for Fish and Wildlife, Parks, and Marine Resources, said the action was necessary to prevent depletion of the loan fund during the next few months and to assure better distribution of the money still available. The current rate for fishery loans is 7½ percent; maximum maturity is 10 years.

Purposes of Loans

Dr. Glasgow said loans are made to finance or refinance the purchase, construction, maintenance, repair, equipping, or operation of commercial fishing vessels or gear. Applications in the first two months of fiscal 1970, which began July 1, 1969, more than doubled applications of a year earlier.

The BCF-administered loan program is scheduled to expire in 1970. Interior Department has recommended extension.

EASTERN PACIFIC YELLOWFIN TUNA CATCH RATE IS CHANGED

The incidental catch rate of yellowfin tuna in the eastern Pacific Ocean for seine vessels of 300 short tons capacity or less reverted to 15 percent on October 2, 1969. This applies to vessels that fish any part of a trip within the regulated area.

THE SHRIMP SITUATION

During January-September 1969, 84.3 million pounds of shrimp (heads-off) were landed in the Gulf States, 10% below the 93.9 million pounds of the 1968 period and 23% below 1967 period.

Heavier September landings were recorded in Florida (West Coast), Alabama, Mississippi, and Louisiana; landings declined in Texas. In eastern and central Gulf, greater abundance of white shrimp improved landings somewhat. White shrimp were not prevalent in Texas.

Of considerable significance were the heavier landings in Mississippi, where the August hurricane devastated most processing facilities. However, the fleet was only slightly damaged and fishing resumed as soon as fishermen got their personal affairs in order.

No High Catch Rate

Of some significance was the fact that shrimp fishing always is excellent for a week or ten days following a hurricane. A possible reason is that the storm chills the water and results in premature schooling of shrimp. Surprisingly, no such high rate of catch was recorded following this hurricane. Some possible causes for this: (1) excessive debris deposited on fishing grounds as result of this devastating storm, (2) local fishermen did not fish for a week or more because of the unusually high incidence of personal loss at home, and (3) fishermen from other areas failed to move into the area because they were uncertain of landing conditions; or, more likely, since catches in the area had been running behind a year ago, they did not expect unusual catches.

Prices Begin To Weaken

Prices generally have been holding firm but have begun to weaken. On October 1, cold-storage holdings were 52.9 million pounds--7.7 million pounds above a year earlier. However, most of this increase, about 5 million pounds, is in breaded, peeled, and deveined; holdings of raw headless are up only 2.8 million.

Most holdings of raw headless, shell on, are of larger sizes and very little small shrimp is available. This is substantiated by conversations with industry and by examination of import and catch data.

Imports

For first 8 months of 1969, imports of raw headless shell on, for example, are one million pounds less than a year earlier; peeled and deveined are 13 million pounds greater than a year earlier. Imports of all types are up about 9 million pounds over a year earlier (109 compared with 117).

GULF MENHADEN FISHERY SETS RECORD

The 1969 season total of menhaden landings along the Gulf of Mexico coast through August was 36% ahead of the 1968 period and 7% better than the comparable period in 1962, the record year.

Despite Hurricane Camille, August 1969 landings about equalled August 1968 landings.

Gulf production was not matched by the Atlantic Coast fishery. There, landings through August 1969 dropped 36% from 1968 and 66% from 1963--the last year of a billion-fish Atlantic fishery.

MANAGEMENT OF MENHADEN FISHERY IS SUGGESTED

Midseason reports show that menhaden, the primary raw material for the Atlantic Coast fish-reduction industry, again have failed to appear in commercial quantities from Delaware to Rhode Island. This was reported in September by the University of Rhode Island (URI) Commercial Fisheries Newsletter. Although some catches were made, the total was less than 10% of the maximum production in previous years.

Fishing on Chesapeake Bay has dropped sharply below 1968. This is strong indication that menhaden will be scarce throughout the middle and north Atlantic grounds during the 1970 season.

The Gulf of Mexico fishery is the one bright spot. The menhaden catch to mid-season was exceptionally heavy. It is possible that the fishery may set a record in 1969.

Gulf Landings Rise

Because of the progressive decline of the Atlantic Coast stocks of menhaden, it is time to pay more attention to the Gulf stocks, the URI newsletter states. Gulf landings have continued to increase. This might be interpreted to mean that the maximum sustainable annual yield has not yet been reached. But continued unrestricted fishing pressure could push this fishery toward extinction.

Management Overdue

Much of the fishing industry is highly independent and opposed to regulation or imposition of quotas. But intelligent management of resources has been beneficial to many fisheries. The application of basic principles of resource management to the menhaden fishery would appear long overdue, the URI newsletter concludes.

ALEWIFE DIE-OFF IN GREAT LAKES IS MINOR

The die-off of alewives in the Great Lakes reached nuisance proportions in only a few areas this year, reports the Great Lakes Commission. Lake Michigan's southern end experienced a "fairly heavy mortality" of the silvery little fish which littered the beaches. In recent years, alewife die-off has been a particular problem in this lake.

In Chicago, park district workers were busy in early July scooping up alewives. Later in July, the die-off was "substantial" along the Indiana shoreline. Around July 21, a sudden rise in temperature of 11-12 degrees in about 48 hours appeared to have triggered the deaths of the temperature-sensitive fish, BCF researchers reported.

Fewer Near Milwaukee

In the Milwaukee, Wisc., area, fewer alewife deaths were reported than in 1968, when the die-off was "moderately light." Vessel and plane surveys found sizable amounts of floating dead fish in the lake's southeastern section in late July. No major concentrations fouled Michigan's lower peninsula shoreline.

Reports from the Lake Ontario area showed that no significant problem had developed this year.

UNDERWATER TUNA SCHOOL TRACKED BY SONAR

For the first time, scientists have tracked a school of tuna underwater using the oceanic equivalent of radar. The feat was accomplished by BCF scientists aboard the Bureau's research vessel 'Townsend Cromwell' in Hawaiian waters in early September. On two occasions, the vessel used sonar to track a skipjack tuna school continuously, for a total of 6 days and 6 nights. Directing the operation was biologist Heeny S. H. Yuen.

The scientists believe they have uncovered some startling aspects of skipjack tuna behavior. Here is their report:

A skipjack tuna school, such as this one, spends the daylight hours near land and comes to the surface layers only infrequently. Toward sunset, the school heads to the open sea, spends the entire night in the surface layers, and travels as far as 60 miles from land. With the coming of dawn, the school returns to the original coastal site, or nearby.

All are facts that carry important implications for biologists and fishermen. They offer clues to the design of new fishing gear and techniques that could open up new fisheries or improve existing ones.

Cromwell's Special Equipment

The Cromwell is equipped with specially designed sonar. Sonar gear detects high-frequency sound waves in water in much the same way that radar detects electromagnetic waves in air. The sonar is a continuous-transmission, frequency-modulated (CTFM) device. It sends out a continuous sonar signal. When the signal is reflected by an object, such as a fish or fish school, the gear can tell the object's distance from the ship, its direction, and depth. This is the sonar's "active" mode.

The sonar also has a "passive," or listening, mode: It listens for acoustic signals emanating underwater. The Cromwell used both modes in tracking the tuna school.

Skipjack Fed Acoustic Tag

Trolling near Kaula Island, a rocky islet about 35 miles southwest of Kauai, Hawaii, the vessel's party caught an 18-inch skipjack tuna. The fish was fed an acoustic tag. This is a cylindrical, battery-actuated, transmitter 3 inches long and less than an inch in diameter. The transmitter produces a short, high-frequency burst of ultrasonic waves at the rate of two a second. These bursts have a frequency of 50 kiloHertz. They cannot be heard by human beings--but are easily detected up to a mile away by the sonar. Earlier experiments in shoreside tanks had shown that a skipjack tuna would accept the tag and continue to swim and eat as usual.

When the tagged skipjack tuna was released, it rejoined the school. This was proved in two ways: First, in the passive mode, the sonar picked up the signal from the transmitter. Switched to the active mode, while trained on the same location, the sonar detected the school of which the tagged fish must have been a member. Second, on one occasion, the fish was lost for a few minutes. Soon observers on deck noticed a school of skipjack tuna feeding at the surface. The sonar was trained on the school and the familiar two-a-second signal of the tagged fish was picked up. Thus, the movements of the tagged fish were taken as representative of the movements of the school.

During Daylight

During daylight hours, the school kept close to the vicinity of Kaula Island, which is surrounded by a narrow shelf about 80 feet deep. About a mile from shore, the shelf breaks into a steep cliff that sweeps down into ocean depths of several thousand feet. It was near this break in slope that the school was first observed; the school returned to it on most mornings. The terrain closely resembles an underwater cliff off Oahu where, in 1966, BCF scientists in a small submarine observed skipjack tuna feeding at 500 feet.

Sundown: Toward Open Sea

Shortly before sundown, the school turned from the bank and swam toward the open sea. The direction of travel varied. One night the school swam southwest, another east, another north. The distance traveled also varied, from 30 miles to about 60. The varied distances mean the school had to adjust its speed to arrive at the Kaula Rock site at dawn. On the 60-mile journey, Heeny Yuen says, the school was swimming at the very

high average speed of 8 knots for more than an hour.

Surface Layer At Night

At night the school kept to the surface layer of the water. It swam steadily in a straight line for an hour or more; often it would pause for as long as an hour. Then it would change direction and swim on.

At the time, the night sky was heavily overcast. To Yuen, it seemed improbable that the fish could be navigating by starlight.

Only on one occasion did the school break its established pattern of movement. Then, instead of returning to the bank at daybreak, it remained 5 miles off the island all day. On the next morning, however, it was back on the bank.

"As she has with many other animals," Yuen says, "Nature has endowed the skipjack tuna with an internal compass and an internal clock."

Tracking the School

The observations of the school's movements were made during two periods. During the first, the vessel tracked it for 2 days and 2 nights, and then had to return to Honolulu for sonar repair. Two days later, it returned to Kaula Island and, within a few hours, again picked up the transmitter signal. The fish was at its accustomed place over the break in slope.

Four more days and nights were then spent tracking the school. The transmitter has a battery life of 200 hours, and the experiment could have lasted at least 2 more days and nights, but Yuen decided that he had learned all he wanted to learn from that school.

Questions About Larger Fish Unanswered

Skipjack tuna form the basis of Hawaii's largest fishery. The catch peaks sharply in summer, when large fish of about 20 pounds are most commonly caught. The fish that was tagged weighed only 3 pounds--so it was far from representative of the bulk of the commercial catch. Since fish schools usually are made up of fish of about the same size, the new information fails to answer questions about the behavior of the larger and older fish.

Some biologists theorize that there is a "resident" population of skipjack tuna around the Hawaiian islands throughout the year, and that the "season" fish are a migrant population. The biologists are eagerly speculating about the results they would get if they succeeded in tagging and following a large tuna.

It is known that the fish, or at least some of them, migrate thousands of miles. But how long these migrations last and the routes taken are matters of speculation. Positive information might help to open the immense central Pacific skipjack tuna fishery to commercial harvest. The yield of the fishery is estimated in the hundreds of thousands of tons; only about 5,000 tons a year now are taken by the Hawaiian fleet.

Richard S. Shomura, Acting Area Director, BCF, Honolulu, says plans are being developed to carry out extensive experiments with tagged skipjack tuna, especially the "season" fish, during the 1970 fishing season.

EAST COAST CLAM DREDGE TESTED OFF OREGON

The BCF Exploratory Fishing Base in Seattle, Washington, reports that the Bureau research vessel R/V 'John N. Cobb' recently returned to Seattle after a 19-day clam-gear testing cruise along the Oregon coast between Coos Bay and Newport.

Eighty-five tows were made with an East Coast 36-inch-bar hydraulic clam dredge at depths from 5 to 15 fathoms. The dredge worked efficiently, without mechanical breakdowns. Seattle gear specialists feel the dredge can be adapted successfully to West Coast conditions.

Only small quantities of razor clams and cockles were collected during the cruise. Very large catches of sand dollars, up to 4 tons per 15-minute tow, necessitated making shorter tows.

DESTROYER'S SONAR TRACKS WHALE

Two marine biologists working for the U.S. Naval Oceanographic Office aboard a destroyer in the Atlantic visually identified sonar "echoes" as a whale.

Biologist William T. Leapley reported: "This was one of those rare incidents--the first time we have been able to verify a sonarman's classification of an 'echo' as a whale sonar target by first actually tracking the source of the contact and then by visually identifying it as a whale--in this instance, a group of five finback whales."

Leapley and his associate, Coleman Levenson, had just completed an investigation into biological sonar targets when sound signals indicating possible whales were received.

Leapley recalled: "At that time, we were off Cape May, steaming toward Newport, Rhode Island. . . .Prior to this, the sonarmen aboard the ship had reported what they thought were the 'echoes' of sound signals bouncing off the bodies of whales, but we had yet to confirm any of these reports through visual identifications of the 'echo' sources.

"So when a sailor awakened me just before dawn on a summer morning to report a whale off the ship's starboard side, I thought that this might be the sighting we had been hoping for. After dashing up to the bridge to have a look, I learned that the 'sighting' was just another sonar contact classified 'probable whale' by the senior sonarman.

"I was about to write it off as a frustrating near miss when Cole (Levenson) arrived on the scene with the suggestion that we try to track down this target and really get some proof of its identity."

Whale Hunt

They received permission to hunt for the whale. As the ship headed at 28 knots back to where the sonarman first picked up the whale contact, they scanned the predawn horizon. Then, dead-ahead, the marine biologists saw "this great long form stretching out in the path of the ship. We would have cut it in half, if we hadn't taken right rudder evasive action. And there lying near our ship were two huge finback whales, 65- to 75-foot specimens that had just surfaced."

The finbacks rank second in size to the blue whales, which reach a maximum of 100 feet. "But the blue whales," Leapley notes, "are becoming very rare, almost extinct due to over-whaling." Finbacks feed on small planktonic organisms through a unique baleen mouth apparatus that works like a sieve.

Maneuvering Around Them

Almost as soon as the marine biologists spotted the two adult finbacks, the destroyer's skipper began to maneuver the vessel in a tight circle around them. Leapley recalls: "About half-way around, the whales dove. Then, about five minutes later, they surfaced again. At about the same time, we noticed that two more adults and a juvenile had also surfaced approximately 100 yards away. By this time, Cole was snapping pictures of the whales."

The skipper was able to maneuver the destroyer to a point 20 yards away from two adult and one juvenile whale--and the biologists got a very good view.

Echoes Tape Recorded

During the 45 minutes the scientists maintained visual contact with the 5 whales, the ship's sonarmen tape-recorded echoes bounced off the mammals' bodies on equipment connected to the ship's sonar.

Leapley concluded: "The tape containing the sounds now definitely determined to be whale echoes will be analyzed further to learn what a whale looks like on sonar equipment. Results of this analysis will eventually help the Navy to classify the mammals."

UNIVERSITY CURRICULA IN MARINE SCIENCES PUBLISHED

The National Council on Marine Resources and Engineering Development has published a compilation of institutions offering courses and degrees in marine sciences during the 1969-70 and 1970-71 academic years. It is entitled "University Curricula in the Marine Sciences and Related Fields."

The publication will help prospective students, research workers, and instructors

identify career opportunities and it will foster full use of educational facilities. In the foreword, Edward Wenk Jr., Executive Secretary of the Marine Sciences Council, emphasizes that skilled manpower is central to achievement of long-range national goals in marine sciences. It is the individual talents that pace our progress, he emphasizes.

What Report Contains

The report is based on information provided by the institutions in response to a questionnaire. Institutions are listed under 5 major categories: Marine Science, Ocean Engineering, Maritime Officers, Fisheries, and Marine Technicians. Each program is described in terms of teaching and research facilities--laboratories, classrooms, ships, computers--and academic programs and staff. Degrees offered and degree requirements are described.

It is available for $2 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

U. S. AIDS GULF OF MEXICO OYSTER INDUSTRY

BCF made available $281,388 in October for the hurricane-damaged oyster industries in Louisiana, Alabama, and Mississippi. The Bureau had determined that a resource disaster occurred when Hurricane Camille ravaged the 3 coastal areas in August 1969.

The money will be used to restore seed oyster grounds under State jurisdiction; $176,388 was allocated to Louisiana, $85,000 to Mississippi, and $20,000 to Alabama. The projects are financed 100% with Federal funds.

BCF acted quickly to provide the funds because the timing of restoration is important: oyster larvae begin arriving in these Gulf Coast waters during October and must have clean shells to which they can attach during their early life.

SENSOR STUDIES TEMPERATURE-FISH MIGRATION RELATIONSHIP

Coast Guard planes flying monthly missions at 130 knots, from 200 to 600 feet above Atlantic and Pacific coastal waters, are becoming valuable parts of the fisherman's gear. Some of the information obtained on these flights is used by the Bureau of Sport Fisheries and Wildlife to "determine the relationship between surface temperatures and the distribution of migratory game fish." The findings also are useful to commercial fishermen; the data may help in predicting the movements of fish from the temperatures the fish are known to tolerate.

The temperatures are detected ("read") with a Barnes infrared thermometer sensor, which transmits them to a strip-chart recorder. The sensor is aimed through a small hatch in a rear window of the plane. Also, scientists note on the chart what they see below.

The Sensor

The sensor exploits the principle that for certain wavelengths the amount of infrared radiation given off by an object is proportional to the surface temperature of that object.

The sensor can be used at virtually any distance--so long as the target fills the field of view. It responds in a fraction of a second; it is ideal for measuring sea-surface temperatures from a plane. The sensor made practical the rapid preparation of temperature maps.

Areas Covered

On July 1, 1969, the East Coast program of obtaining monthly sea-surface temperatures was transferred from the Marine Laboratory of the Bureau of Sport Fisheries and Wildlife (BSFW) at Sandy Hook, N. J., to the Coast Guard's Oceanographic Unit in Washington, D. C.

On the West Coast, similar flights are made from BSFW's laboratory in Tiburon, Calif.

Monthly flights along the East Coast are made between Cape Cod, Mass., and Miami, Fla.; along the West Coast, between Vancouver Islands, B.C., and Northern Baja California, Mexico.

Charts are issued after each series of flights and depict the flight paths and contours of surface isotherms. The data are used in ecologic studies to help explain temperature's

Fig. 1 - Looking through hatch for marine animals. Infrared Thermometer Sensor is to right.

Fig. 2 - Coast Guard team at work.

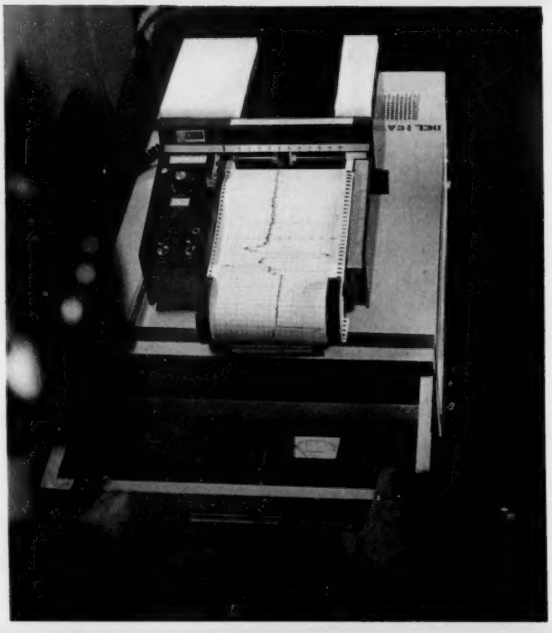
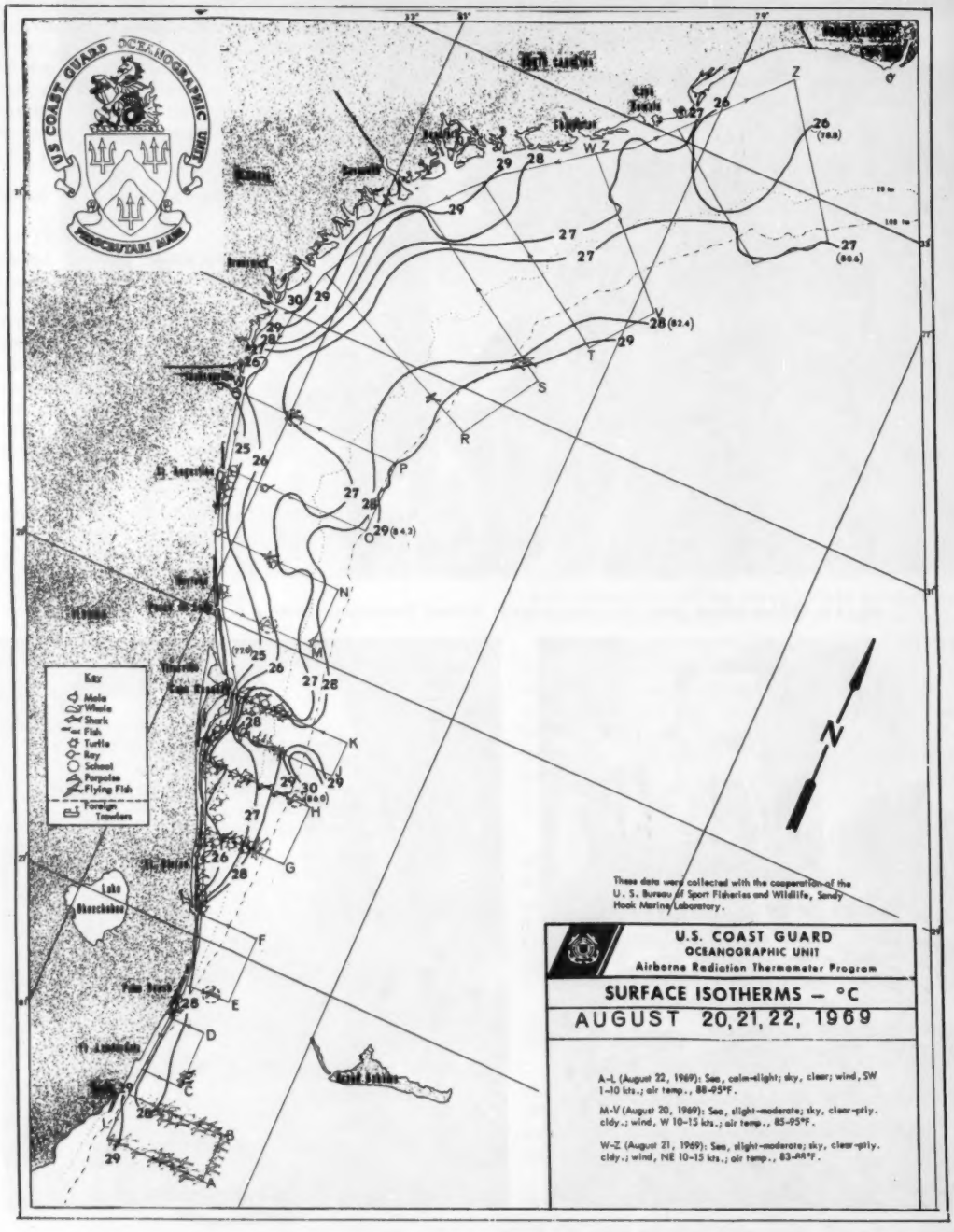


Fig. 3 - Strip Chart Recorder for Infrared Thermometer Readout.
(All Photos: Coast Guard)


U.S. COAST GUARD OCEANOGRAPHIC UNIT
PRAECURSITAMI MARIS
Key
Mola
Whale
Shark
Fish
Turtle
Ray
School
Porpoise
Flying Fish
Foreign Trawlers
Lake Okeechobee
Palm Beach
Fort Lauderdale
Miami
Key West
Saint Petersburg
Tampa
Cape Canaveral
Jacksonville
Savannah
Charleston
Cape Fear
Norfolk
Virginia Beach
These data were collected with the cooperation of the U. S. Bureau of Sport Fisheries and Wildlife, Sandy Hook Marine Laboratory.
U.S. COAST GUARD
OCEANOGRAPHIC UNIT
Airborne Radiation Thermometer Program
SURFACE ISOTHERMS — °C
AUGUST 20, 21, 22, 1969
A–L (August 22, 1969): Sea, calm-slight; sky, clear; wind, SW 1–10 kts.; air temp., 88–95°F.
M–V (August 20, 1969): Sea, slight-moderate; sky, clear-ptly. cldy.; wind, W 10–15 kts.; air temp., 85–95°F.
W–Z (August 21, 1969): Sea, slight-moderate; sky, clear-ptly. cldy.; wind, NE 10–15 kts.; air temp., 83–88°F.

influence on distribution of migratory fishes--and on seasonal cycles of ocean productivity.

The charts are sent to hundreds of private and government institutions, newspapers, and commercial and sport fishermen.

Sightings of Marine Life

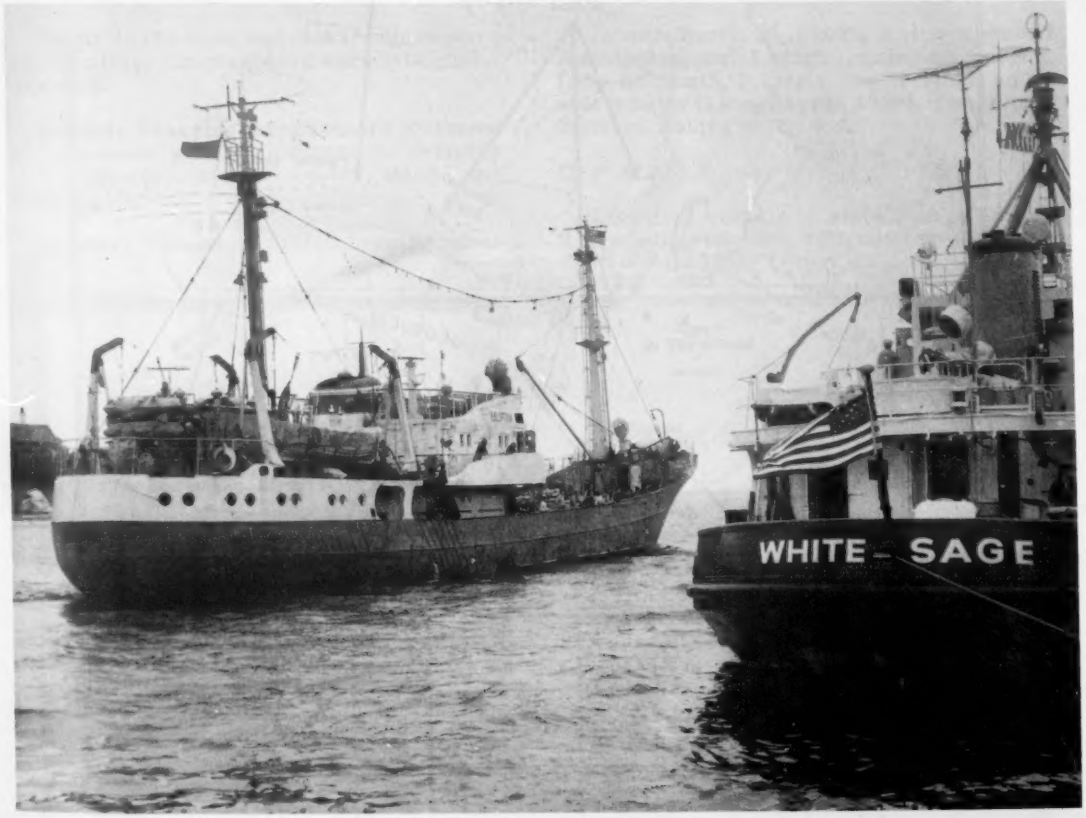
During East Coast flights, the crew reports and photographs sharks, turtles, porpoises, whales, and foreign fishing vessels. These are shown on the charts. Occasionally, scientists who are expert in recognizing marine life from the air are aboard. They increase the biological information obtained.

SOVIET RESEARCH VESSEL ARRIVES AT WOODS HOLE

The Soviet research vessel 'Ekliptika' arrived at Woods Hole, Mass., September 28, 1969. Research this year includes a study of herring spawning.

Chief Scientist is Vladimir Sauskan, expert on the life history of Atlantic hake. He has studied various species of Merluccius throughout North and South Atlantic.

The first cruise has been successfully completed. It was a 3-vessel operation; the Soviet 'Aliot' joined in the work at Sauskan's request. The survey cruises were scheduled to end in November.



Atlantniro's 'Ekliptika' leaving Woods Hole (Mass.) Coast Guard Base to join BCF's 'Albatross IV' for a joint survey (September 1969). (Photo: Robert K. Brigham)

FOREIGN FISHING OFF U.S., SEPTEMBER 1969

Generally good weather permitted excellent coverage of the northwest Atlantic off New England; 340 foreign fishing and support vessels were sighted (325 sighted in August). (Fig. 1.)

SOUTHERN NEW ENGLAND & GEORGES BANK

USSR: 75 vessels--34 factory stern trawlers, 126 medium side trawlers, 6 factory base ships, 8 refrigerated transports, and 1 tanker (102 vessels in September 1968). Catches, moderate to heavy, were primarily herring and mackerel.

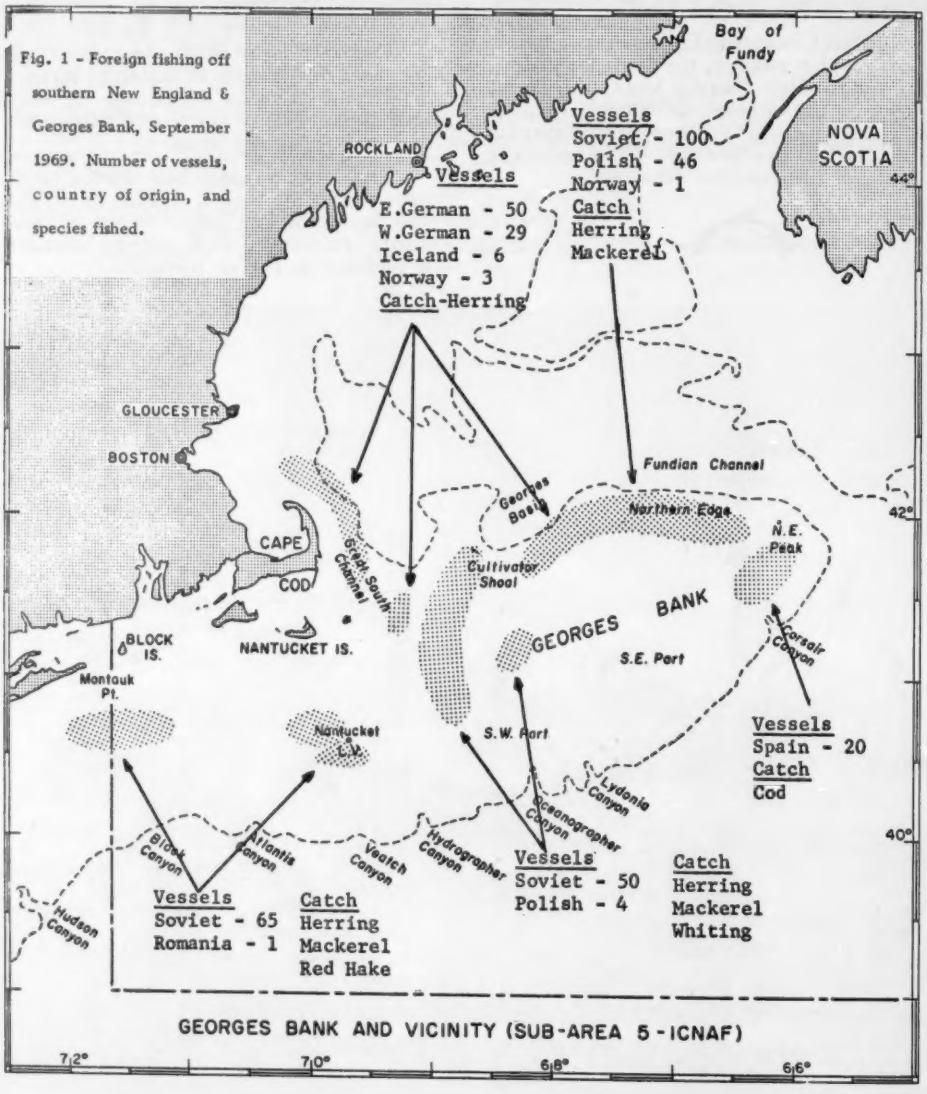


Fig. 1 - Foreign fishing off southern New England & Georges Bank, September 1969. Number of vessels, country of origin, and species fished.

Poland: 50 vessels--13 stern trawlers, 32 large side trawlers, 2 factory base ships, 3 carriers (25 in Sept. 1968). Catches, moderate: herring and mackerel.

East Germany: 50 vessels--29 factory and freezer stern trawlers, 19 side trawlers, 2 factory base ships (20 in 1968). Catches, moderate to heavy, probably herring.

Floating cod-end and pickup techniques were used: A BCF Agent saw 3 floating cod-end sections buoyed together and containing over 100,000 pounds. Retrieval through stern opening of factory base ship took about 15 minutes.

West Germany: 28 freezer stern trawlers, 1 fisheries protection vessel (21). Catch was mainly herring.

Spain: 15-20 stern and side trawlers were pair trawling. Catches were excellent (probably cod).

Iceland: 6 herring purse seiners continued at-sea transfers to U.S. carriers for delivery to reduction plants at Gloucester, Mass., and Amagansett, L.I.

Norway: 1 stern trawler, 3 herring purse seiners.

Romania: 1 stern trawler. Catch was presumably herring and mackerel. (Same trawler, 'Galati,' sighted in September 1968.)

Japan: 1 stern trawler.

GULF OF MEXICO & SOUTH ATLANTIC

No foreign fishing vessels reported.

WEST COAST

USSR: 3 stern trawlers, 6 support vessels, 2 research vessels off Washington and Oregon, and adjacent to Canadian coast off Vancouver Island (33 in September 1968). Catch: Pacific hake. Several hauls estimated at 10,000-35,000 pounds were observed off Washington.

Japan: Early in month, 1 longliner off Washington, and 1 stern trawler off Oregon. Late in month, 2 longliners, 1 stern and 1 side trawler (1 longliner in 1968). Longliners believed fishing black cod.

OFF ALASKA

USSR: 17 vessels (5 more than in each of 2 preceding months, half number sighted in September 1968). (Fig. 2.)

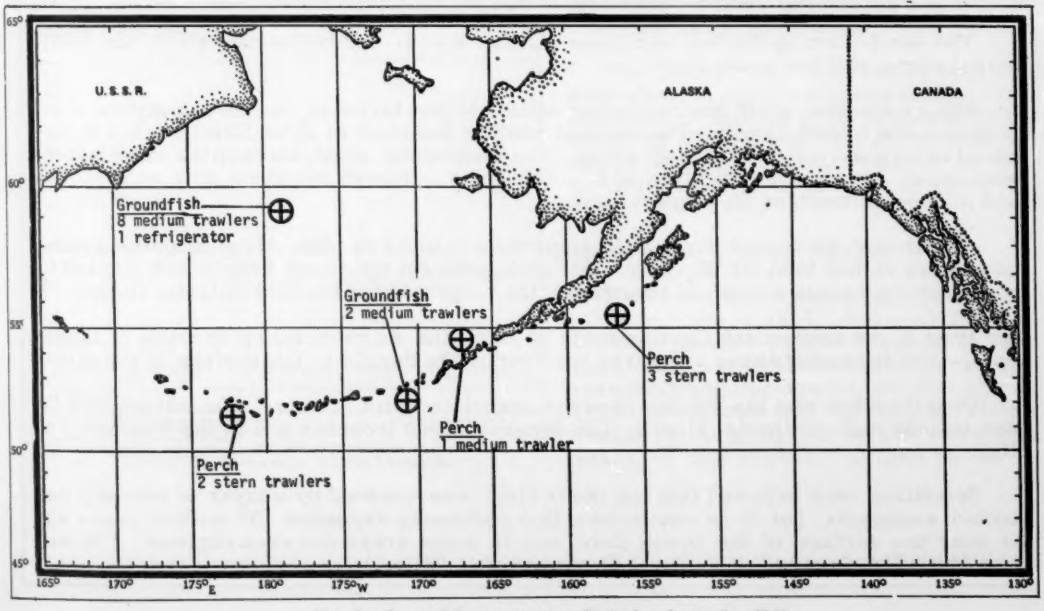


Fig. 2 - Soviet fishing activities off Alaska, September 1969.

Japan: 110 vessels at end of September (190 in August).

Ocean perch: In Gulf of Alaska, about 15 stern trawlers till mid-month; at month's end, 6 were between eastern and central Gulf. Off Aleutians, stern trawlers decreased from 6 to 5--3 south of eastern Aleutians, 2 along western.

Groundfish: Early in month, 12 stern trawlers along Continental Shelf edge in Bering Sea; end of month, 6: 3 in eastern Bering, northwest of Unimak Pass, 3 in central Bering, northwest of Pribilofs.

Minced fish-meat, meal and oil: 5 factoryship fleets fishing Alaska pollock and flatfish, decreased to 3: 2 in central Bering, north of Pribilofs, 1 in eastern Bering, north of Unimak Pass.

The 2 crab fishing fleets departed the eastern Bering Sea after mid-month.

Sablefish: 8 longliners in August; 9 in September--6 in eastern and 3 in central Gulf.

South Korea: Shin Hung's trawling fleet--1 factoryship, 1 carrier, 7 trawlers--left by September 1. One large and 2 small stern trawlers in eastern Bering Sea also believed to have left. Late in month, a new stern trawler appeared in eastern Bering and began trawling groundfish, primarily Alaska pollock.

WHAT DOES THE SEA FLOOR LOOK LIKE?

The sea bottom is divided into three distinct areas: the continental shelf, the continental slope, and the ocean floor.

The continental shelf has numerous hills, ridges, terraces, and even canyons comparable to the Grand Canyon. The average width of the shelf is about 30 miles, but it may extend several hundred miles from shore. The continental slope, between the shelf and the deep ocean, has an average slope of 2 to 3 degrees, although the slope off a volcanic island may be as much as 50 degrees.

Features of the ocean bottom are comparable to those on land. Many mountains under the sea are higher than Mt. Everest. All oceans except the North Pacific are divided by an almost continuous system of mountains, the largest being the Mid-Atlantic Ridge.

Most of the deep-ocean floor is made up of basins surrounded by walls of lesser depth. Oceanographers have compared the floor of the Pacific to the surface of the moon.

Deep trenches rim the Pacific in areas associated with great volanic activity and lie near islands and continental slopes. The deepest known trenches are in the Western Pacific.

Scientists once believed that the ocean floor was covered by a layer of recently deposited sediments, but it is now known that sediments deposited 100 million years ago lie near the surface of the ocean floor and in some areas are even exposed. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

STATES

ALASKA

1969 SALMON PACK IS NEARLY MILLION CASES BELOW 1968's

The Alaska Department of Fish and Game reported in September:

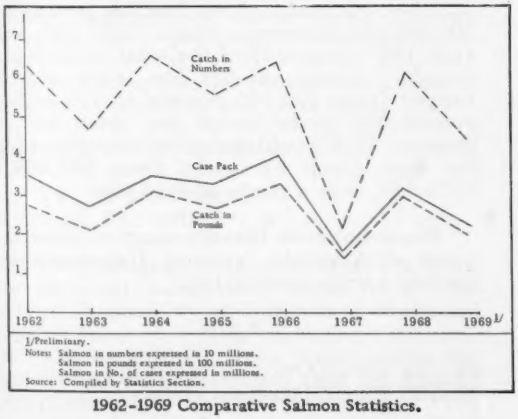
"The 1969 salmon season is basically over now. The preliminary final case pack for this year by region in number of cases is as follows:

	Kings	Reds	Cohoes	Pinks	Chums	Total
Southeastern	302	35,497	8,824	231,105	32,705	308,433
Central	6,106	311,605	13,723	992,286	123,146	1,446,866
Western	28,584	440,276	1,793	33	26,037	496,723
Total	34,992	787,378	24,340	1,223,424	181,388	2,252,022

"This year's salmon pack was nearly a million cases below that of the 1968 season. A total of 2.2 million 48-pound cases was packed in 1969 compared to 3.1 million cases in 1968. As shown by the graph the pack in 1967 was 1.5 million cases.

"The extremely poor season in Southeastern accounted for practically all of the deficit. The Panhandle catch produced 308,433 cases compared to 1.4 million in 1968.

"Central Alaska's catch produced 1.4 million cases in both 1968 and 1969 while Western Alaska showed an improvement of 138,000 cases over last year.



1962-1969 Comparative Salmon Statistics.

"The Department each year publishes a weekly Salmon Case Pack by geographical area. Just what does this weekly case pack represent? For one thing over a seven year average the pounds of salmon producing the case pack represented 78% of the total production poundage.

"The graph shows the number of cases of salmon packed, the total catch in numbers of salmon and the total pounds over the years 1962 to 1969. By using this information and knowing what the weekly case pack is at any time during the fishing season, a person can quite easily estimate salmon caught to date either in number or pounds. Sometimes a picture is truly worth 10,000 words."

* * *

LARGEST BRISTOL BAY RUN PREDICTED FOR 1970

The largest salmon catch in the history of the Bristol Bay fishery is in prospect for 1970. This was the preliminary forecast in late September by the Alaska Department of Fish and Game in Juneau.

The inshore run forecast in Bristol Bay sees about 64 million sockeye salmon returning; over 40 million of these should be harvested by fishermen. However, some indicators estimate inshore returns as low as 50 million--a yield similar in size to the parent year 1965.

Maybe Over 5,000,000 Cases

A 40-50 million catch would far exceed the historic highs of 1917, 1938, and 1965, when sockeye catches ranged from 24 to 25 million. The case pack from such a catch, plus relatively good prospects for pink salmon in 1970 throughout Gulf of Alaska districts, should result in highest pack in more than 20 years. It may exceed 5 million cases.

Processing Problems Foreseen

Although more than enough fishermen live and work in Alaska to harvest the expected 1970 bonanza in Bristol Bay, processors may have problems handling the catch, Governor Miller emphasized. This is because the run in the Bay is short and the industry physically limited.

1 River System

The huge size of the expected Bristol Bay run is almost solely attributable to a single river system: the Kvichak River-Lake Iliamna-Lake Clark. Over 52 million sockeye of the 64 million run will return to this watershed, most of these from a single age class of 5-year-olds produced from high-cycle-year spawning in 1965; then, about 25 million escaped the fishery and ascended the river.

High Levels Confirmed

Preliminary indications from high-seas fishing at Adak in 1969 on immature salmon that will make up 1970 run generally confirmed very high levels of abundance. Improved growth rates had occurred compared to parent cycle. The fishing was done by the University of Washington working under U.S. contract.

The 1970 run should require about 14 fish to make a 48-pound case of salmon; in 1965, 17 fish were required.

Other Good Runs

The preliminary forecast for Bristol Bay indicates the Naknek, Egegik, and Ugashik Rivers also will have relatively good runs in 1970. The resident fishermen, especially of Ugashik, recently suffered a series of very poor runs.

* * *

FISHERY ECONOMICS HAS SOME BRIGHT SPOTS

Several reports have indicated the plight of the Alaska fishermen: a low average annual income that would reduce them to a poverty level if total catch value were distributed evenly among all. In 1967, the value of Alaska's catch, $48.8 million, divided among 18,172 fishermen would give an average annual gross income of $2,685. After depreciation, expenses, and taxes, most would have lost money.

Recently, Bill Evans, Statistician of BCF Juneau, drew "an altogether different picture for those who are truly fishermen in Alaska."

SE Alaska Troll Fishery

In the Southeast Alaska troll fishery, 22% of the 1,792 so-called trollers caught 76.4% of the fish. Evans arrived at these figures by going through the list of annual total vessel landings by vessel number. He recorded only trollers catching 1,000 fish or more.

The highliner took 7,000 fish, and the most common (modal) catch for the group was about 2,500 fish. Based on catches of about 25% kings and 75% cohos, the vessel landing 1,000 fish would have grossed about $6,450. The modal annual catch of 2,500 fish would have grossed the fishermen about $16,000; the highliner with 7,000 fish would have grossed about $45,000. Most of these vessels probably fish for halibut also, and perhaps for some other species; so these would have higher annual earnings than indicated from the figures that could easily be obtained.

Central Alaska King Crab

In the Central Alaska king-crab fishery of 222 vessels, only those landing more than 300,000 pounds were counted. Forty-one vessels, 18%, caught 52% of the total 37.3 million pounds. Annual catches for these vessels ranged from 300,000 pounds to 1.5 million pounds; the modal catch was about 500,000 pounds. This would amount to gross earnings for this group ranging from $75,000 to $375,000, with a mode of $125,000.

Evans believes these examples show that many of Alaska's "serious fishermen are making a very good living."

* * *

STATE INSURANCE DIRECTOR URGES FISHERMEN'S CO-OP

Alaska's State Insurance Director, W. W. Fritz, testifying in September before a Congressional Committee in Kodiak, urged Congress to make available a back-up fund of $2

million to form a fishermen's insurance co-operative in Kodiak. This was reported in the Kodiak 'Mirror'.

Fritz said that the insurance industry has virtually no interest in providing marine insurance to North Pacific fishing vessels because of the high rate of boat disasters and resulting heavy losses to insurance firms.

The fishermen of the North Pacific, for the most part, cannot afford the high and increasing rates of marine insurance coverage. One international requirement for getting marine insurance involves hull stability tests. The stability tests are expensive.

Own Co-Op Needed

Fritz envisions the area's fishermen setting up their own insurance pool through an insurance cooperative and a Board they select. The Board, made up of fishermen, would decide which vessels could belong to the cooperative. He said the fishermen know which are the good and the bad risks. Fishermen rejected by the Board would have to pay the commercial rate to be insured by the co-operative.

Insurance pool cooperatives already have been operating for years in Seattle, Wash.

Fritz said the cooperative would need initially a back-up fund of about $2 million to sustain it against any losses during its first few years. He urged that the first insurance cooperative be organized in Kodiak. This one would help set up similar cooperatives in such areas as Bristol Bay and Cook Inlet.

* * *

BCF HELPS COUSTEAU
PREPARE SALMON FILM

In early August, scientists of BCF's Auke Bay (Alaska) Laboratory aided the 6-man crew of Jacques Yves-Cousteau's 'Calypso' in production of a film on sockeye salmon. Two Kodiak Island bases were used: the BCF station at Karluk Lake, and the Fraser Lake station of the Alaska Department of Fish and Game. A small part was made in a salmon cannery at Alitak Bay.

Part of Life Cycle

The film covers that part of the salmon's life cycle dealing with the adult's return to the spawning grounds. It includes the fishery, morphological changes in adult fish prior to and after spawning, the spawning act, behavior, and death.

It is expected that the film will be ready for distribution to theaters and ABC and BBC TV in about a year.

CALIFORNIA

TO BUILD FIRST STATE-OWNED
CHANNEL CATFISH HATCHERY

California's Wildlife Conservation Board is financing construction of California's first state-owned hatchery for channel catfish. Building of the $1.2-million Imperial Valley Warmwater Hatchery will begin about Jan. 1, 1970, and take a year.

The Hatchery

The hatchery will be on state property 6 miles north of Niland, on east side of Salton Sea, in Imperial County. It will consist of 17 rearing ponds, each 6 feet deep, covering nearly 100 acres; 3 residences, and an administration building including shop, warehouse, office, and ice-storage facilities.

The Department of Fish and Game will take over operation when the hatchery is completed. The Department recommended construction after nearly 4 years of on-site testing.

500,000 A Year

About 500,000 one-half-pound channel catfish will be reared annually. These will be stocked in many suitable Southern California reservoirs and units of the State Water Project. The channel catfish growth rate is exceptionally fast, and the growing season lasts all year.

* * *

TAGGED STURGEON MIGRATE FAR

A green sturgeon tagged in 1967 in San Pablo Bay, Calif., by the California Department of Fish and Game, has been caught by a commercial fisherman in Grays Harbor, Washington. It was one of 25 tagged that year. Two other tags were returned from the same group, one from Santa Cruz, Calif., the other from Astoria, Oregon.

3 from 1954 Tagging

Three tags from a 1954 California tagging program also were recovered far away: one from Astoria, at liberty more than three years; another from the same area after 431 days; the third after 1,067 days in Winchester Bay, Oregon.

This indicates that green sturgeon migrate along the Pacific coast for considerable distances. They are likely to mix with other populations.

NEW YORK

LONG ISLAND SOUND POLLUTION DOUBLES IN DECADE

Two New York Congressmen warned on October 24 that Long Island Sound was becoming more polluted--and that efforts to improve its water quality were becoming less effective. This was reported the next day by Nancy Moran in 'The New York Times'.

Rep. Ogden R. Reid, Westchester County Republican, said: "Long Island Sound is in danger of becoming another Lake Erie. The water is twice as dirty as it was 10 years ago and the pollution is spreading out from the shoreline."

Rep. Lester L. Wolff, Nassau County Democrat, said Congress should create an intergovernmental commission "to stop the piecemeal destruction that is going on now."

Pollution Increases Sharply

The Congressmen had seen the results of a survey released that week by Interior Department's Federal Water Pollution Control Administration (FWPCA). The report showed that the bacteriologic count in L.I. Sound had risen sharply along shorelines.

Russell E. Train, Interior Department's Under Secretary, commented on the survey: "There is clear evidence of deterioration at the western end of the sound. The bad spots are danger signals that give us a chance to save the sound as a whole."

The survey was made in October by Interior Department's 64-foot, laboratory-equipped 'Clean Waters'. Water was sampled at 100 places throughout the sound.

Sewage Treatment Lags

Most pollution, the survey found, came from the discharges of 179 municipal sewage facilities into the sound--and from commercial navigation, pleasure boats, and dredging. There are 10 times more pleasure boats than 10 years ago.

Less than half the municipal sewage facilities provide secondary disinfecting treatment. Under U.S. regulations, all municipal facilities are slated to have secondary treatment by 1972. Some are behind schedule.

Nuclear Plants Planned

Water quality may be affected significantly by planned construction in the 1970s of 5 nuclear-fueled power plants in the area. The plants would use billions of gallons of water a day for cooling. The hot water discharged into L.I. Sound would cause an almost immediate change in water temperature.

Conservationists oppose the plants because warming of water disrupts fish life. It also fosters growth of algae--from mild green fuzz to huge seaweed-like plants that now are harming Lake Erie.

Effect on Shellfish

The Clean Waters cruised up and back 30 miles, from Port Chester to Flushing Harbor, through murky water. Most of this water has been closed to shellfish harvesting in recent years because of high bacterial counts.

Daniel Marchishin, a sanitary engineer who had gathered water samples, reported many people shellfishing. He said: "We're not policemen, so we let them alone, but I sure wouldn't want to eat those clams."

He and 2 assistants sampled for coliform, rod-shaped bacteria found in the intestines

of warm-blooded animals. At Whitestone Bridge, coliform count was 27,000 per 100 milliliters; at Port Chester Harbor, 14,000 per 100 milliliters. In shellfish areas, 70 per 100 milliliters is standard count.

Coliform counts midstream in the sound and east of Port Jefferson generally were much lower; the water was of "generally good quality."

FWPCA Survey in 1972

The Federal Water Pollution Control Administration plans a comprehensive survey of L.I. Sound in 1972. But, Cong. Reid said, "the pollution problem is growing every day" and the FWPCA survey should begin immediately.

WASHINGTON

HAKE LANDINGS IN PUGET SOUND REACH 9 MILLION POUNDS

Hake landings in Puget Sound during the past season were about 9 million pounds. Chances for a record disappeared when 2 major buyers of hake restricted landings or stopped buying.

A new, floating, fish-meal plant at Neah Bay, Wash., suffered mechanical problems from the time it opened in Nov. 1968. It was forced to limit landings until late March 1969, when it closed for major repairs.

Million-Pound Vessels

Five of the 6 vessels in the 1968-1969 fishery landed over 1,000,000 pounds each; 2 exceeded 2,000,000 pounds. Catch rates for the 6 were higher than in 1967-1968--but the significance of this is uncertain because trawler efficiency differed.

FLORIDA

SHRIMP FARMING STUDY WINS EDA FUNDS

The Economic Development Administration (EDA) has granted $180,759 to a firm to help determine the feasibility of raising fresh-water shrimp on Florida Indian reservations and other underdeveloped lands. The shrimp is the Macrobrachium species indigenous to Florida.

The funds will help pay for a 2-year project of growing fresh-water shrimp in a controlled environment--and demonstrating shrimp cultivation on a semicommercial scale. The study will be conducted on the Big Cypress Reservation in Broward and Hendry counties, about 65 miles northwest of Miami. The Seminole Indian Tribe is leasing the land.

Could Help Indians

The firm says that if fresh-water shrimp farming proves feasible, there would be jobs for Indians on whose reservations the shrimp would be raised. Techniques developed would be adaptable to other parts of the U.S.

Facilities and technical help will be provided by the Bureau of Indian Affairs and Bureau of Commercial Fisheries, Interior Department, Florida Soil Conservation Service of the U.S. Department of Agriculture, and by the Florida Game and Fresh Water Fish Commission. Total cost is $334,290.

EDA

EDA was established under the Public Works and Economic Development Act. It is authorized to conduct the research that will help to create new jobs and boost incomes in areas with employment problems.

COMMONWEALTH OF PUERTO RICO

'STAHL' FINDS SNAPPERS & GROUPERS IN UNEXPLOITED AREA OFF PUERTO RICO

Large red snapper, lane snapper, and grouper are available in an area not generally exploited by local fishermen. The area is Vega Baja to Cerro Gordo. This was discovered in September during exploration and test fishing by the M/V 'Agustin Stahl' of Puerto Rico's Department of Agriculture.

Fishing Tests

The Stahl conducted fishing tests in various depths up to 110 fathoms with fish pots. The results were lane snapper, red snapper (up to 10 pounds each), and grouper.

Local fishermen normally do not use fish pots in this area. The test results may encourage their use. Stahl personnel are helping fishermen build and operate the pots.

A TRAWLER'S VOYAGE POINTS UP U.S. FISHERMEN'S PROBLEMS

Elliot Carlson

HAMPTON, VA.--Old and weather-beaten, the trawler 'Dragnet' slips almost unnoticed into this fishing port. Despite five tough days at sea, the crew of this 35-ton boat shows no elation at the sight of land. For the trip, in the argot of ocean-going fishermen, was nearly a "broker." There was barely enough money made to cover expenses, leaving little for the crew.

The problems were many: Too much time spent chasing too few fish. Mechanical mishaps. Bad weather that cut short the voyage. And, most depressing of all, an unexpected sharp drop in the price of flounder--for which the men were fishing eight miles off the Virginia coast.

"Many more trips like this one and we'll be out of business," grumbles Capt. James Callis, the pipe-smoking, 47-year-old skipper and part-owner of the Dragnet.

"Captain Jimmy" and his two hands aboard the Dragnet aren't alone in their troubles. Indeed, unproductive trips like this one are becoming all too familiar for many American deep-sea fishermen. For one thing, once-prolific species are dwindling. North Atlantic waters no longer yield the rich catches of cod, haddock and ocean perch of just a few years ago. Farther south, catches of porgy, sea bass and flounder have slumped. In Pacific Northwest waters, halibut and king crab are in short supply. The result: America's total fish catch last year was the second smallest since 1942.

FOREIGN RIVALS

Fishermen blame their woes on Russian ships and other foreign fleets that increasingly work waters near the American 12-mile limit. The problem may worsen. Two weeks ago a foreign fleet of more than 300 boats, at least 200 of them flying the Soviet flag, was reported sweeping the New England coast.

Of course, by no means are all species on the decline. The 1968 shrimp catch set a record, and the tuna catch, while down, remained at a high level. Still, concern is heightening over the plight of the U.S. fishing industry, which pulled in $472 million worth of fish in 1968. "Large portions of the industry are in deep trouble," says Lee J. Weddig, executive director of the National Fisheries Institute Inc., a trade group. "The catch is declining, equipment is lagging and there are few, if any, profits."

Much of the American fishing fleet is old, inefficient and unable to compete with the large, modern craft in foreign fleets, which are capable of operating thousands of miles from home ports. There are, to be sure, exceptions; at least 350 new vessels joined the U.S. shrimp fleet last year. But noting that 60% of America's boats are over 16 years old, a Bureau of Commercial Fisheries report states flatly: "Most of the U.S. fleet is obsolete."

RUGGED INDIVIDUALISTS

What's more, foreign boats, often subsidized by their governments, are geared to cooperate in their expeditions. The large Russian fleets regularly send out scout boats that search for schools of fish. American captains, however, tend to be small businessmen who view each other as competitors. Crusty and independent, they aren't inclined to cooperate. And like many small businessmen, they're also plagued by rising costs, especially for labor and insurance.

Whatever the reasons, the U.S. is rapidly losing its place as a world fishing leader. The U.S. share of the total world catch of fish has dropped to 5% from 13% in 1956, thereby moving the nation to sixth from second place (Peru is first). And while America's annual production has varied little since 1945, the world catch of fish has increased more than threefold. The U.S. now imports nearly three-fourths of the fish it consumes.

A Congressional committee that studied the predicament of the fishing industry

This article appeared in the 'Wall Street Journal,' Sept. 29, 1969.

recently commented that "vessels generally become much less economical to operate by the time they are 15 years old." A case in point is the 31-year-old Dragnet, whose mechanical woes add considerably to expenses. "Something is always falling apart," sighs Capt. Callis, a slightly built, unflappable man who has skippered the boat for 15 years.

CATCHING AN ANCHOR

A few days aboard the 65-foot trawler illustrate what the captain means. The first day out the boat's nets were badly shredded when she snagged an old ship's anchor. It took the captain and his two-man crew three hours to disentangle the anchor and repair the net, a delay that cost the men at least one net-load of fish. On the second day, a vital link holding the net to a cable snapped loose, permitting the net to dangle freely in the water. It took an hour to fix and probably cost another haul. (Actually, the boat got off easy this trip; a few months ago she had to be towed home when a propeller was damaged.)

Finally, the weather--a constant worry to fishermen--forced the Dragnet to shorten her trip by two days. But it's unlikely that the extra days at sea would have greatly improved the Dragnet's fortunes. For while the fishing wasn't disastrous, it was mediocre. "I'm not so much disappointed as bored," muttered the captain as he bent over the wheel on the second day. "Ten years ago you could catch twice the fish in half the time."

Capt. Callis and his crew work 14 hours a day, from first light at 5 a.m. to 9 p.m. How do they spend the late evening hours? They fish--this time for themselves, dangling lines over the boat's side. Usually they have even worse luck than during the day: On this trip they caught nothing in two nights of trying. "We just like to fish," said deck hand Garland Smith, baiting a hook with a piece of raw fish.

During the day, the trawler usually has time for seven hauls--assuming nothing breaks down--as she cruises back and forth off the Virginia coast. The nets cut a 60-foot swath along the ocean floor; after covering about two miles, they're hauled in with winches. Each haul yields roughly 70 to 150 pounds of fish.

All told, the Dragnet must haul in about 4,500 pounds of flounder on each trip for the captain and crew to make a modest profit. This is based on prices to the fishermen ranging between 30 and 60 cents a pound, depending on the size of the fish. But on this trip, the catch was only 3,000 pounds, and prices--for reasons that still aren't clear to Capt. Callis--slumped to an average of 27 cents a pound. (The wholesaler who bought the Dragnet's load claims prices always drop after the summer.)

"That was a real blow," says the skipper, noting the boat grossed only about $800 for the five-day effort. The amount was so small it couldn't be divided up in the usual manner, which calls for 40% to be set aside for boat upkeep, 10% to go to the captain and his fellow owners, about $350 to defray expenses and the rest to go to the crew (which again includes the captain). Almost nothing would have been left for the crew had the captain followed this formula, so he juggled expenses so that each man got $100 for about 70 hours work.

Capt. Callis concedes this is low pay, but he has troubles of his own. For the owners to break even each year, he has to gross a minimum of $50,000. This isn't always easy. Last year, for example, the Dragnet's 13-year-old engine broke down, idling the boat for three months. As a result, the captain showed a slight loss for the year. Despite declining catches, it's still possible to make a profit most years because the prices of many dwindling species have doubled or better over the last five years, the skipper says.

Even so, the skipper finds himself caught in a profit squeeze. Higher prices may enable him to gross about what he could when fish were more abundant, but the increases in costs cut profits. For one thing, insurance for his boat and crew now costs him $6,200 annually, up from about $3,000 ten years ago. The costs of fuel, ice, nets, cable and other equipment are also rising.

While he can survive for the moment, the captain worries about the future. "Prices have gone about as high as they can go," he maintains. "So if the fish keep declining, I don't know what's going to happen."

PROPOSALS FOR CURES

Government and industry sources believe Capt. Callis' troubles are typical (the 35-ton

Dragnet may seem small, but only 13,000 of the country's 84,200 commercial fishing boats weigh five tons or more). Lately, dozens of proposals have been advanced for revitalizing the fishing industry. Early this year the President's Commission on Marine Sciences, Engineering and Resources recommended, among other things, that the U.S. develop a "technically advanced fishing fleet" and also reduce "excess fishing effort" in order to replenish depleted species.

One cost problem affecting U.S. fishermen stems from a 1793 law requiring that vessels landing fish in U.S. ports be built in this country. Construction costs in the U.S. are about double those elsewhere. A bill to end the restriction has been introduced in the Senate, but it is given little chance of passage.

In 1964, Congress did pass a law granting subsidies covering up to 50% of the cost of new boats built in the U.S. The law expired in June, and a bill to renew it has been passed by the House and is pending in the Senate. But funds for the subsidies have been scarce, and so far only 32 new boats have been built under the program.

Department of Interior officials say they have been somewhat more successful in efforts to ease pressure on over-fished species. A spokesman notes that in 1967 the Russians agreed to refrain from fishing for flounder, porgy and a few other species found to be declining near U.S. shores. Officials say the program is working, but some fishermen claim the Russians frequently ignore the agreement.

Capt. Callis says that early this year his trawler passed within 100 yards of a Russian fishing boat hauling in large amounts of porgy. He says he complained to the Bureau of Commercial Fisheries but found the agency skeptical. "They asked if I could prove the fish were porgy," recalls the captain. "Hell, I've been chasing porgy all my life, I ought to know what they look like."

The captain claims that during the same trip a Russian boat veered towards the Dragnet and nearly rammed it. The incident was reported to the State Department, but nothing came of it, he says. "A lot of those Russian boats just want to hog the bottom--and since they're bigger than we are, there isn't much we can do about it," he grumbles.

The large Russian, Japanese and other foreign fleets that work off American coasts are equipped to haul in many more fish than U.S. boats. For instance, Russian trawlers, which range up to 423 feet in size, are large enough to pull two sets of nets--one dragging the bottom and one dragging at middle depths. This technique enables them to double their catch.

"The Dragnet simply doesn't have the power to pull more than one set of nets," says Capt. Callis. Fishermen also complain that the Russians use a much finer net, which permits them to fish for a number of species simultaneously. (American boats generally fish for just one species at a time.) The Russian trawlers periodically transfer their catches to large mother ships that process, can and refrigerate the fish while still at sea.

A LOW-PRESSURE LIFE

Despite the industry's troubles, most fishermen are reluctant to leave their jobs, although there have been some departures. Nationally, the number of commercial fishermen declined to 136,500 in 1967 from 161,463 in 1950. Only about 45 trawlers now operate out of Hampton, compared with about 100 ten years ago, according to one study.

Captains complain that young people are rejecting the fishing life for softer land-based jobs. But some fishermen say the low-pressure life at sea has its compensations.

"Out here you're your own boss--there aren't all kinds of people standing over you," says deck hand Smith of the Dragnet. Still, he concedes his income is unimpressive. The two Dragnet deck hands say they gross $4,000 to $5,000 a year. They get no overtime pay, no paid vacations and few other fringe benefits.

Nor does the Dragnet offer her crew much in the way of amenities. The only fresh water comes from a small, hand-operated pump in the bow. Hence, everyone foregoes bathing, tooth-brushing and other niceties during what is ordinarily a seven-day trip. The captain and crew sleep in cramped quarters in the bow or in the engine room, which is hot and reeks with diesel fumes. (Indeed, a passenger found his engine room bunk so intolerable he ended up sleeping on the floor of the pilothouse.)

Food on the Dragnet, however, is good and hearty. Mulligan stew, pork chops, hot dogs and beans--and occasionally fish--are standard fare concocted by deck hand Eugene White, 44, who doubles as cook.

TUNA PURSE SEINE FISHERY IN EASTERN TROPICAL ATLANTIC

John P. Wise

Since the 1950's, a surface fishery for tunas has been carried on in the eastern tropical Atlantic, principally in the Gulf of Guinea and southward. The Gulf of Guinea fleet, originally almost all French, has been augmented by a few vessels from other countries in recent years. In 1967, three American seiners made successful trips to the area and, in 1968, eight American and four Canadian seiners fished in the area during the second half of the year with good results.

In addition to the Gulf of Guinea fishery, now carried on most of the year, there is a less important winter-spring pole-and-line fishery by small French "ice boats" from Dakar. This fishery ranges from 5° N. to 20° N., not more than 250 miles from the coast and around the Cape Verde Islands.

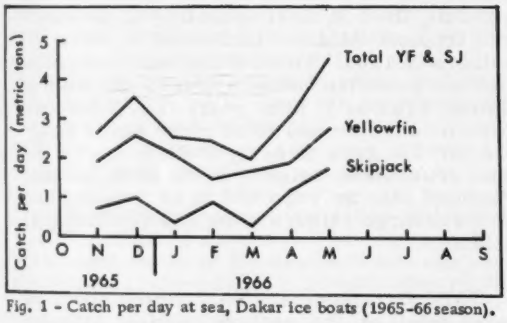


Fig. 1 - Catch per day at sea, Dakar ice boats (1965-66 season).

In the early years of the Gulf of Guinea fishery, almost all of the fishing was done by pole-and-line, but the recent tendency has been for seiners to enter the fishery and for the bait boats to change over to seining. In 1967, seiners made up nearly half of the fleet landing at Pointe-Noire--18 seiners vs. 21 bait boats. (Many of the seiners use live bait to hold the schools while the net is being set.)

The Pointe-Noire fleet, mostly French, concentrates on yellowfin tuna, but there has been a tendency in recent years to land more skipjack tuna. Landings in 1967 and 1968 ran about 85 percent yellowfin, with the remainder almost entirely skipjack. This fleet is supplying a selective market, however, and the landings do not necessarily reflect the distribution of catchable fish. American seiners fishing in the same general areas in 1967 and 1968 landed about 35 percent skipjack.

A clear picture of the distribution of good fishing areas is emerging. This is attributable to the cooperation of the skippers of the U.S. and foreign fleets, and of the French fishery scientists in west Africa who have analyzed the landings data from the fleet that lands at Pointe-Noire. On the basis of the results of the Pointe-Noire fleet in 1967, and the U.S. and Canadian fleets in 1967 and 1968, the best yellowfin tuna seining areas from June to November are:

June	0° - 1° S.	6° - 7° E.
July	1° N. - 1° S.	7° - 9° E.
August	1° N. - 1° S.	4° - 6° E.
	0° - 2° S.	7° - 9° E.
September	1° N. - 2° S.	8° - 9° E.
	0° - 2° S.	7° - 8° E.
	1° S. - 2° S.	5° - 6° E.
	2° S. - 4° S.	7° - 10° E.
	7° S. - 8° S.	11° - 13° E.
October	4° S. - 5° S.	10° - 11° E.
	7° S. - 8° S.	10° - 12° E.
	7° S. - 10° S.	12° - 13° E.
November	7° S. - 9° S.	11° - 12° E.
	7° S. - 11° S.	12° - 13° E.

Abundance of pole-caught yellowfin tuna in the area increases steadily from February until August, then declines again until February. In some years the peak has been in September, or even as late as October.

The author is a fishery biologist with BCF Tropical Atlantic Biological Laboratory, Miami, Florida 33129. Contribution No. 136.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 853

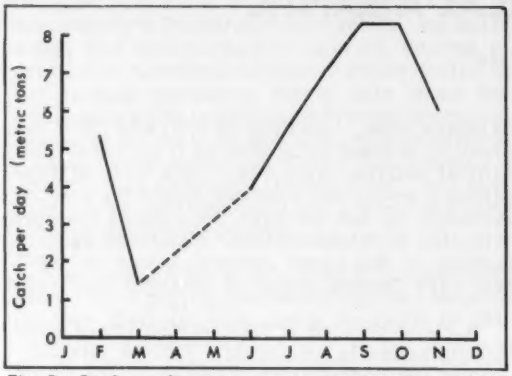


Fig. 2 - Catch per day fishing, seiners landing at Pointe-Noire (1967).

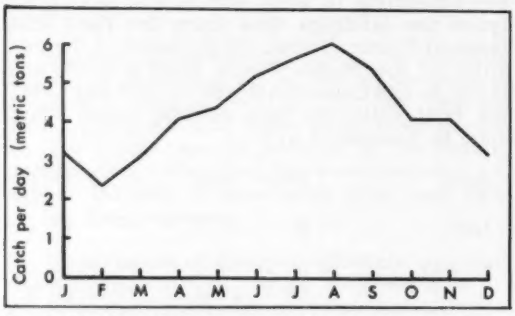


Fig. 3 - Catch per day fishing, live-bait boats landing at Pointe-Noire (1964-67 smoothed average).

A comparison of the good west African fishing areas with the average surface temperatures shows an apparent relation between the areas of good fishing and the 24° C. and 25° C. (roughly 75°-77° F.) isotherms. The relation is consistent with reports of the French researchers at Pointe-Noire (Congo). They have mentioned frequently that the "Berrit Front," identified with the 24° C. isotherm moving from just south of the equator in July to about 13° S. in January, appears to be a concentrating mechanism for tunas.

The Tropical Atlantic Biological Laboratory, a research unit of the Bureau of Commercial Fisheries, has been carrying on studies of tuna biology and oceanography in the eastern tropical Atlantic since 1963. In 1968, the research vessel 'Undaunted' made two cruises to the area (January-May and August-December). We were particularly interested in the distribution and abundance of tuna schools and the relation of tuna to such factors as thermocline depth and water temperature. Some of the information gathered on these cruises is included in this report.

Interest by the U.S. tuna fleet in the eastern tropical Atlantic surface fishery heightened in the summer of 1969. This was due to the closure of the eastern tropical Pacific fishery in mid-April, and the success of U.S. seiners in the Atlantic in 1967 and 1968. As a result, the U.S. fleet operating in the eastern tropical Atlantic increased to over 20 seiners in 1969. Three Panamanian seiners and two Canadian seiners joined the Gulf of Guinea fishery this year. The Japanese government licensed three more purse seiners for the area in early 1969, bringing the total of Japanese seiners in the area to nine. Portugal also is reported to be sending two or three large seiners to the eastern tropical Atlantic.

TABL Data Summary No. 7, which contains more detail on the eastern tropical Atlantic purse seine fishery, is available from the Tropical Atlantic Biological Laboratory, Miami, Florida 33149.

FISHERY OCEANOGRAPHY--IV

OCEAN SALINITY AND DISTRIBUTION OF PACIFIC SALMON

Felix Favorite

Pacific salmon (genus Oncorhynchus) have effective mechanisms for adapting to the osmotic pressures of fresh and salt water, but the significance of salinity on the distribution of salmon is open to question. Young fingerling salmon leaving fresh-water streams and entering the ocean appear able to control their movements so as to permit a gradual acclimatization to oceanic salinities. A fishery biologist studying salmon blood informed me that he routinely placed live adult salmon caught in salt water directly into fresh-water holding tanks without adverse affects. He could thus see no reason why salinity had any bearing on the distribution and migration of salmon in the ocean. Whether any distress was experienced by the salmon, or whether its fresh-water migration had already begun, are beside the point. Salinity, as defined scientifically, is basically determined from measurement of the amount of chloride ion. As such, it has no mysterious characteristics other than degree of concentration. I do not imply that salmon cannot detect small differences in concentration of other ions, but only that salt is salt. However, knowledge of the vertical and horizontal distribution of salinity permits us to ascertain general oceanographic conditions and processes.

Our early investigations (1955-56) were conducted during summer. The salmon were not caught south of the southern boundary of the temperature-minimum stratum described in part 3 of this series of articles. After the 1956 summer season, we were notified that the 'Charles H. Gilbert' of the BCF Honolulu Biological Laboratory had caught four pink salmon (O. gorbuscha) near lat. 41°30' N, long. 165° W in April 1956. The southern boundary of the offshore feeding grounds in the eastern part of the ocean was thereby extended several hundred miles. When sufficient oceanographic data were available, it was possible to show a striking change in the vertical salinity distribution at this latitude (42° N). To the north, salinity increased monotonically with depth, but to the south a salinity-minimum stratum existed at depth. This division was clearly indicated by a vertical 34 ‰ isohaline in the surface layer, which was separate and distinct from the underlying 34 ‰ isohaline (which sloped downward from north to south across this latitude--fig. 1).

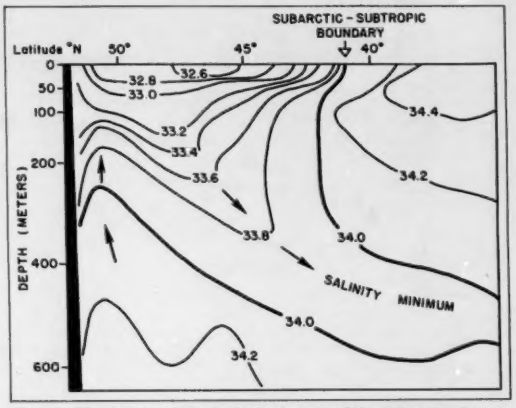


Fig. 1 - Vertical section of salinity in central North Pacific Ocean showing near vertical 34 ‰ isohaline near lat. 41° N, which marks the Subarctic-Subtropic Boundary and the southern limit of Pacific salmon. Arrows indicate probable vertical circulation.

At this point we had three environments: northern, characterized by a temperature-minimum at depth; transition, with monotonically increasing values of temperature and salinity with depth; and southern, characterized by a salinity minimum at depth (fig. 2). For convenience, the first two were subsequently defined as within the Subarctic Region, even though the transition environment should not be considered subarctic because of its occasional high temperatures. The boundary between the transition environment and that having the salinity-minimum stratum is now referred to as the Subarctic-Subtropic Boundary; it has withstood the test of time as the southern limit of the Pacific salmon in the central North Pacific Ocean.

Dr. Favorite is an Oceanographer with BCF's Biological Laboratory, 2725 Montlake Blvd. East, Seattle, Wash. 98102.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 854

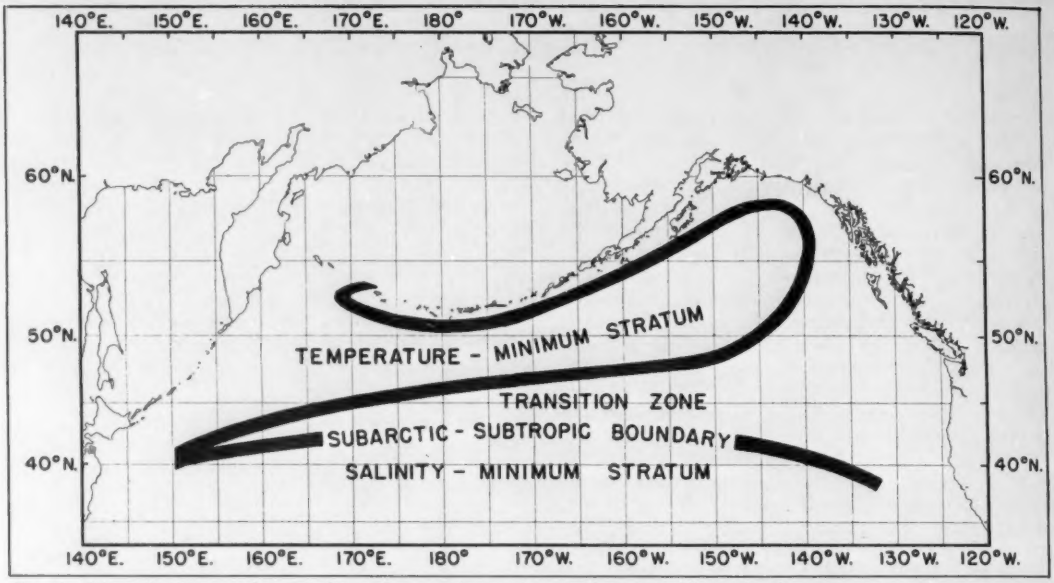


Fig. 2 - Schematic diagram of extent of two salmon environments--one characterized by a subsurface temperature-minimum stratum and the other a transition zone, with neither a temperature- nor salinity-minimum stratum. The Subarctic-Subtropic Boundary denotes the southern limit of Pacific salmon in the open ocean.

The location of the Subarctic-Subtropic boundary also was found later to be an area of distinct changes in type and amount of planktonic forms. But no investigation has been made of the tongue-like intrusion of typically subarctic water, which extends as a salinity-minimum stratum south of lat. 40° N under the surface lens of the saline subtropic surface water. A number of years ago, before we were able to conduct winter salmon fishing, I speculated that some salmon might winter in this deep stratum far removed from the winter storms prevalent at the surface. Although we caught enough salmon at the surface at higher latitudes during winter to challenge this hypothesis, we have never caught them in sufficient quantities to establish a winter distribution pattern. Indeed, it would be interesting to investigate the biomass in this stratum during winter.

The distribution of salinity at depth also provides some clue as to cause of the temperature-minimum stratum. A plot of depth at which the 34 ‰ isohaline occurs (fig. 3) indicates that it rises closest to the surface in a plateau-like structure around the temperature-minimum stratum. If we accept the premise of a northward flow of deep or bottom water from the Antarctic region into the North Pacific Ocean, the physical barrier imposed by the boundary of the Gulf of Alaska and Aleutian Islands could deflect this water upward and cause a certain type of water structure. The subsequent formation of a sharp halocline at the interface of the deep saline water, transported upward, and the bottom of the surface layer of dilute water, limit the downward movement of cold but dilute surface water during winter turnover to 100-200 m. depth, and the temperature-minimum stratum occurs.

I am aware that it would be advantageous to characterize stream runoff by specific chemical constituents or ratios of chemical constituents. The chemistry of sea water, however, is infinitely complex. Several years ago, when we established a chemical oceanography section in our Oceanography Program, we made little progress even though we adopted relatively new techniques, such as atomic absorption spectrophotometry. Dr. T. Joyner (a member of our group at that time) measured particulate aluminum in the plume of the Columbia River by this method. He showed that this technique was almost as effective as that of using salinity to define the extent of the plume; however, particle setting rates which affect the horizontal distribution were not considered.

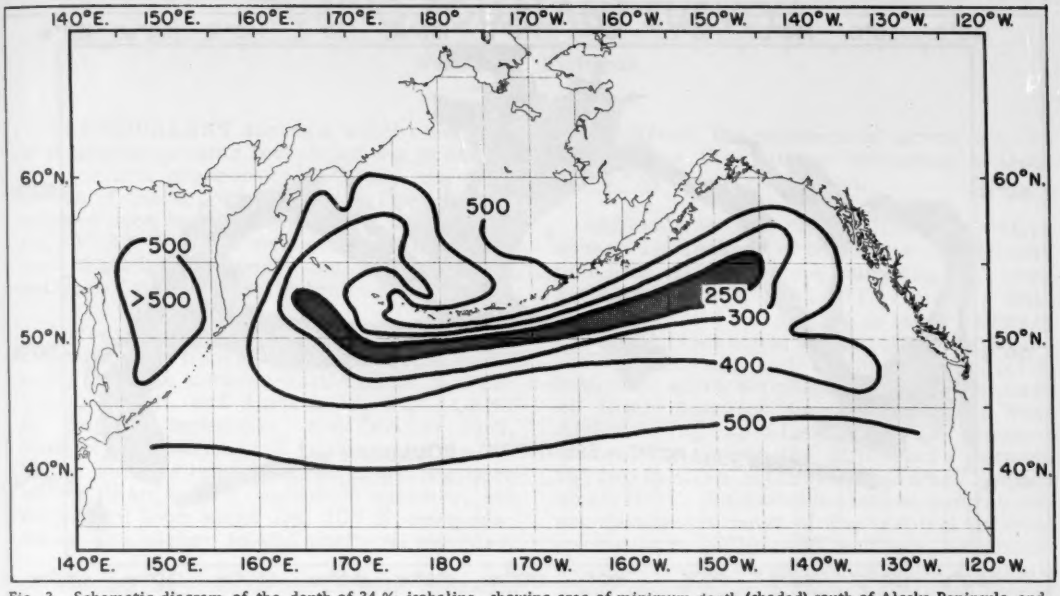


Fig. 3 - Schematic diagram of the depth of 34 ‰ isohaline, showing area of minimum depth (shaded) south of Alaska Peninsula and Aleutian Islands.

That other properties are also advected with the dilute runoff is not extensively documented because most of the elements amenable to analysis at sea are nonconservative--in other words, they are modified by other processes. These properties are primarily nutrients such as phosphate, silicate, or nitrate, which may be consumed by living plants--or replenished by decaying plants and animals as the plume moves seaward. Improvements in chemical analytical techniques for accurate determination of trace elements and other chemical constituents of sea water are sorely needed; such improvements will greatly aid in determining where in the ocean a homing salmon first chemically detects its natal stream, if indeed it ever loses contact.

Surface temperature was not discussed in the previous article because the so-called latitudinal "march" of isotherms, northward in spring and southward in summer as a result of the increasing and decreasing latitude of the sun, is well documented. From ships and satellites, we now obtain data at 5-day intervals on distributions of surface temperature, but no data on distributions of surface salinity. This is unfortunate because the salinities would be more useful than the temperatures in determining flow. Such observations are not made aboard "Ships of Opportunity" (merchant vessels), and remote sensing of salinity is not possible. Equilibration of heat at the sea-air interface and other processes tend to mask advective temperature anomalies, but salinity anomalies in some areas can be traced for great distances.

Surface salinity across the North Pacific Ocean above lat. 45° N is about 33 ‰. At no other place in the world's oceans (except in coastal regions or the Arctic) is there water of such low salinity. At these latitudes in the North Atlantic Ocean, salinity is over 2 ‰ higher (34 ‰ is about the mean value for the surface salinity of the oceans). The Subarctic Pacific Region is characterized by a net precipitation over evaporation. The extensive spring runoff from snowsheds at these latitudes lowers salinity of coastal waters during spring and summer. If we consider the 32.6 ‰ isohaline as indicative of coastal water, we find that it extends over a wide area of the Region (fig. 4).

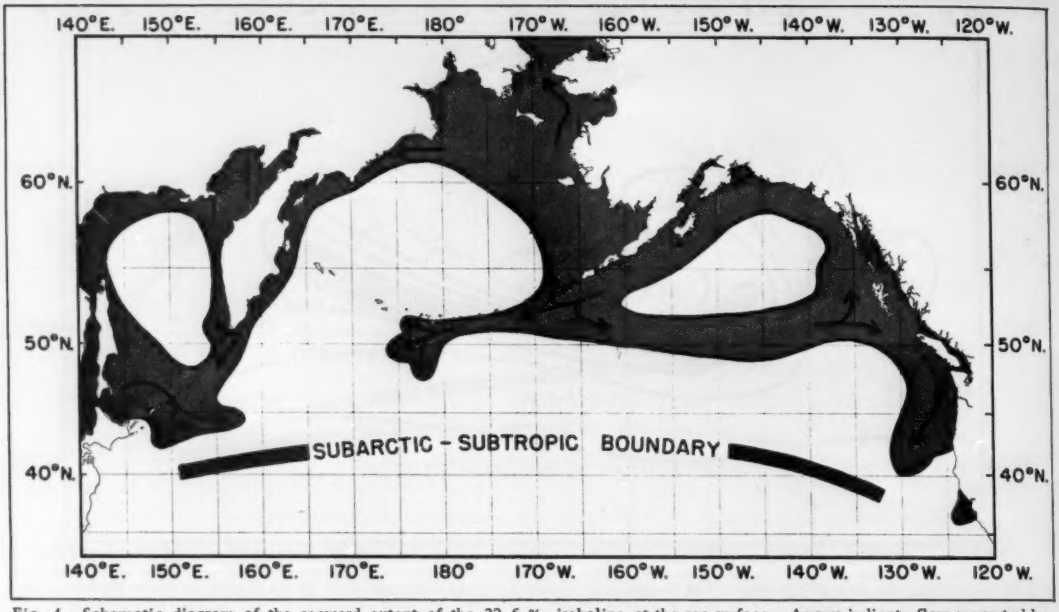


Fig. 4 - Schematic diagram of the seaward extent of the 32.6 ‰ isohaline at the sea surface. Arrows indicate flow suggested by salinity distribution.

The broad continental shelf in the Bering Sea is covered with dilute water from various river runoffs. The absence of any source of deep, saline water (because of the shallow depths) prevents surface salinities in this area from attaining the higher values found in oceanic areas. South of the Bering Sea, it is obvious that dilute water occurs largely inshore of water overlying the temperature-minimum stratum, except where definite intrusions are made into oceanic areas. One location is offshore of the Columbia River, and another is south of the Alaska Peninsula, where a southward intrusion clearly denotes a closed circulation in the Gulf of Alaska. Intrusions at the westward extremity of the Aleutian Islands and on the western North Pacific from the Kuril Island area quickly lose their identity by mixing with more saline oceanic waters; their extents are no longer indicated by surface salinity because of the broad area of rather uniform oceanic salinities. Other characteristics of these two plumes permit us to follow them farther seaward.

In the next article, I shall describe other methods that are used to trace these intrusions of water from the North American and Asian coasts farther into oceanic areas. We shall see how the intrusions appear to influence the ocean distribution of North American and Asian stocks of sockeye salmon (O. nerka).

TROPICAL ATLANTIC TUNA LARVAE COLLECTED DURING EQUALANT SURVEYS

William J. Richards

The EQUALANT surveys, which consisted of multiship oceanic investigations, provided an excellent opportunity to study the tuna larvae of the tropical Atlantic Ocean (considered here to be between lat. 20° N. and lat. 20° S.). The surveys were undertaken as part of the International Cooperative Investigations of the Tropical Atlantic (ICITA).

Dates of the surveys were chosen to coincide with the two oceanographic seasons which occur in these waters--EQUALANT I: February, March, and April 1963; EQUALANT II: August, September, and October 1963. Most of tropical Atlantic is characterized by higher surface temperatures in the northern spring than in the northern summer, but northward from about lat. 10° N. temperatures are higher in the northern summer.

The larvae considered include yellowfin tuna, Thunnus albacares (Bonnaterre); bigeye tuna, T. obesus Lowe; albacore, T. alalunga (Bonnaterre); bluefin tuna, T. thynnus (Linnaeus); and skipjack tuna, Katsuwonus pelamis (Linnaeus). The principal reason for collection of larval tunas is that their presence in an area is indicative of the recent spawning of adults; thus the date and place of spawning may be inferred from the distribution of the larvae. Besides distribution data, aspects of the relation of the distribution and abundance of the larvae to physical features of the environment were analyzed from temperature and salinity measurements.

Distribution

Total larvae collected for each species studied (EQUALANT survey number in parentheses) were: yellowfin tuna 158 (I), and 209 (II); bigeye tuna 53 (I), and 45 (II); albacore 1 (I); bluefin tuna 3 (I); and skipjack tuna 222 (I) and 181 (II). Distribution charts for yellowfin tuna, bigeye tuna, and skipjack tuna are shown in figures 1, 2, and 3. To facilitate comparisons, the numbers of larvae are expressed as the number occurring beneath 100 m^2 of sea surface area.

Differences in the distribution and relative apparent abundance of the larvae of yellowfin tuna (fig. 1) and bigeye tuna (fig. 2) were striking during EQUALANTS I and II. Both species were concentrated in large numbers off West Africa and scattered off South America in collections made during EQUALANT I; both were more abundant in collections made off South America than in those off West Africa during EQUALANT II. Water temperatures may explain the differences because the two species apparently "prefer" waters above 26° C. Skipjack tuna larvae were abundant throughout most of the tropical Atlantic during both EQUALANT surveys, but absent off Cape Verde during EQUALANT I (fig. 3). Their distribution closely paralleled that of larval yellowfin and bigeye tunas during EQUALANT I, but the latter two species were scarce south of the Equator during EQUALANT II. Apparently skipjack tuna larvae are more tolerant of cool water temperatures than are the larvae of the other species (see below).

Of the two other species of tunas obtained during EQUALANT I, the single albacore larva was collected at lat. 4°30' S., long. 33°30' W., on 5 March. One bluefin tuna larva was caught at lat. 7°56' S., long. 15°27' W., and one at lat. 5°00' S., long. 15°29' W., on 22 March; and one at lat. 6°11' N., long. 13°26' W., on 29 March. Neither species was caught during EQUALANT II.

Temperature and Salinity Relations

Tuna larvae are assumed to be confined predominantly to the mixed surface layer. Comparisons of temperature and salinity values of the mixed surface layer with the distribution of the larvae indicated that only temperature is significant. At most

Dr. Richards is Supervisory Zoologist, BCF Tropical Atlantic Biological Laboratory, 75 Virginia Beach Drive, Miami, Florida 33149.
Contribution No. 133, BCF Tropical Atlantic Biological Laboratory, Miami, Florida 33149.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 855

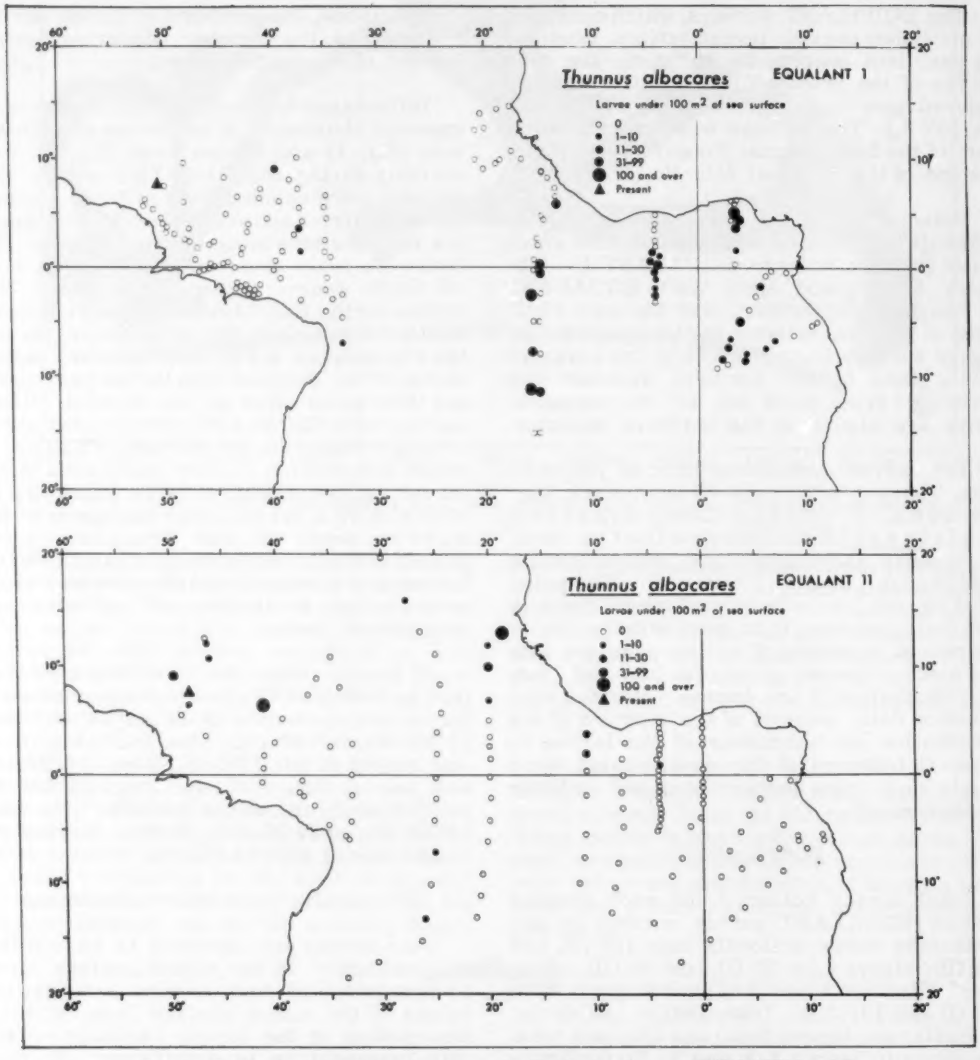


Fig. 1 - Distribution and relative abundance of yellowfin tuna larvae, EQUALANTS I and II.

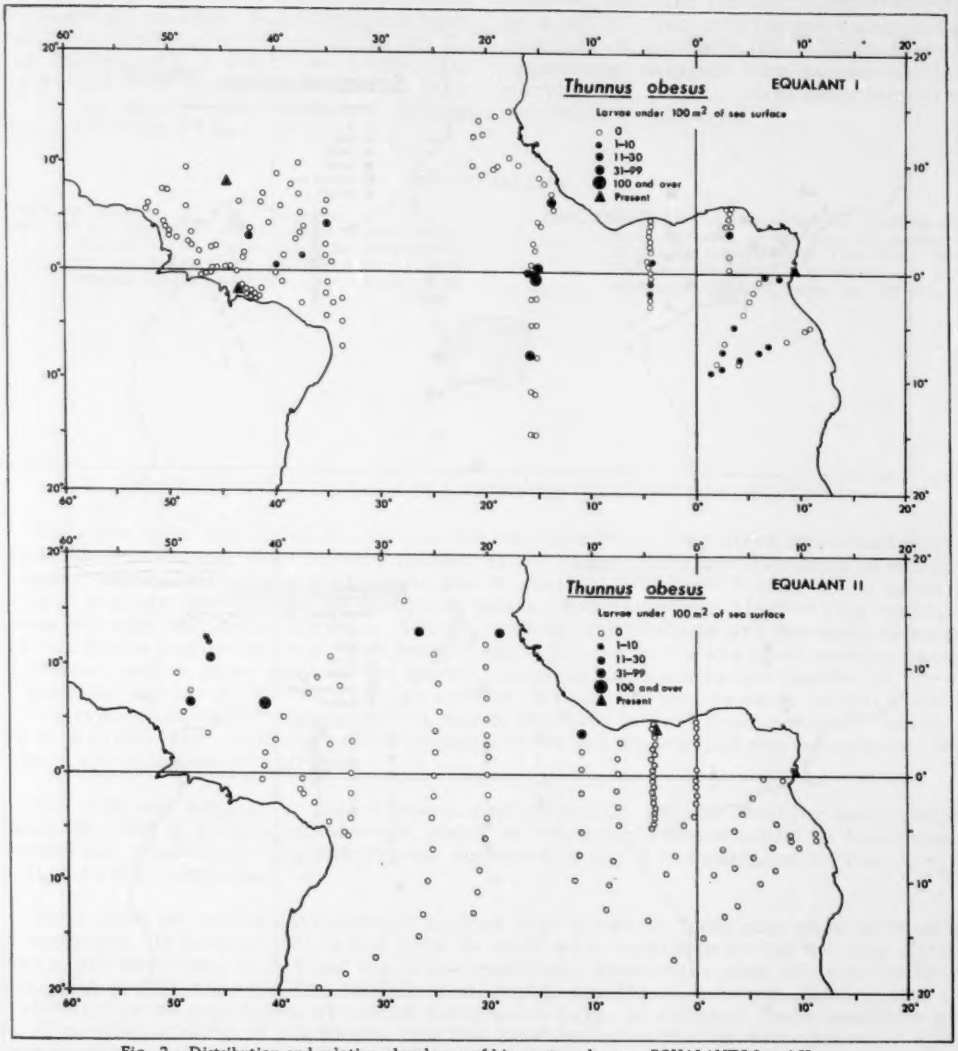


Fig. 2 - Distribution and relative abundance of bigeye tuna larvae, EQUALANTS I and II.

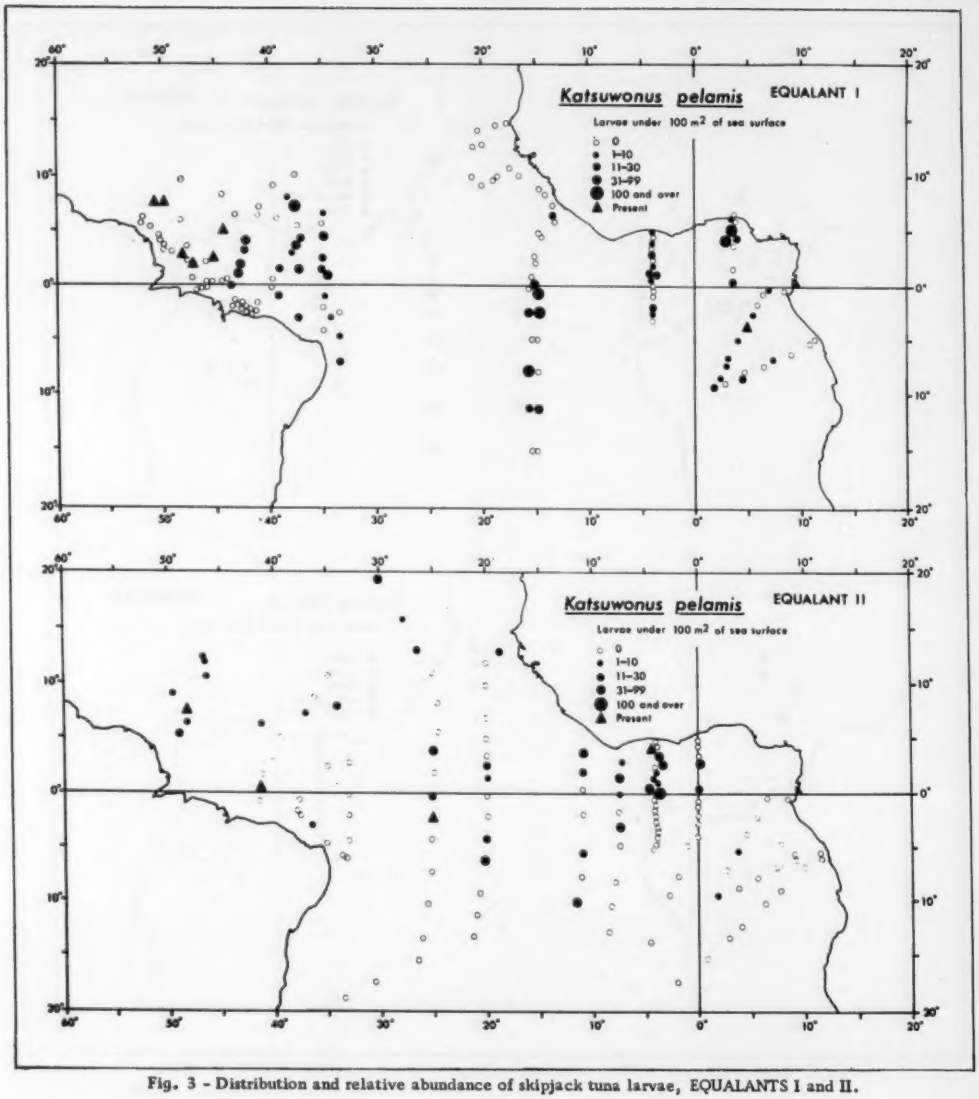


Fig. 3 - Distribution and relative abundance of skipjack tuna larvae, EQUALANTS I and II.

EQUALANT I stations, temperatures were between 26.0° and 29.0° C.; during EQUALANT II they were between 24.0° and 27.5° C. Yellowfin and bigeye tuna larvae were taken only where water temperature was greater than 26.0° C. (26.1° to 29.4° C.). Skipjack tuna larvae were taken only in waters above 26° C. during EQUALANT I (26.1° to 29.4° C.), but in waters both cooler and warmer than 26.0° C. (in nearly equal numbers) during EQUALANT II (23.4° to 27.5° C.).

Conclusion

Larvae of yellowfin, bigeye, and skipjack tunas are widely distributed throughout the tropical Atlantic Ocean. Temperature may be a limiting factor in the spawning or larval survival of yellowfin and bigeye tunas, but apparently skipjack tuna spawn and larvae survive within the limits of water temperature variation in this area.

LITERATURE CITED

RICHARDS, WILLIAM J.
1967. On the distribution and abundance of tuna larvae. Abstract No. 37. Proceedings of the symposium on the oceanography and fisheries resources of the tropical Atlantic. FAO Fish. Rep. No. 51, p. 60.

1969. Distribution and relative apparent abundance of larval tunas collected in the tropical Atlantic during EQUALANT surveys I and II. Proc. Symp. Oceanogr. Fish. Res. Trop. Atl. - Review Papers and Contributions. UNESCO, Paris. pp. 289-315.

WHAT OTHER SEA LIFE IS USED FOR HUMAN CONSUMPTION?

Fish are only one form of marine life used for food. Two other important sources are shellfish and algae. Shellfish are not fish at all; rather, they are members of two large groups of marine animals--crustaceans and mollusks. Lobsters, crabs, and shrimp are the most popular crustaceans on American tables. Spiny lobsters, Alaskan king crabs, and prawns are also harvested for food. Clams, oysters, and scallops are the most commonly eaten mollusks in this country. However, many other mollusks are used in some parts of this country and in other parts of the world. Mussels and cockles are popular in Europe, and squid is popular in Southern Europe and the Orient. Abalone is eaten in the Orient and the Western United States. One noted delicacy of the West Indies is conch salad; conchs are also used in chowder. Still more exotic delicacies are sea urchins and sea cucumbers; these animals are relatives of starfish.

Although not popular in this country, sea mammals provide food for many peoples. Whales provide a great deal of meat which is marketed commercially in Japan and the Scandinavian countries. The Eskimo has depended on seals and walruses for food, oil, fur, and leather for centuries.

Food from the sea is not limited to animal life. Seaweeds have also been used as food for centuries. In Iceland, söl, a red alga, is used as a vegetable during the long winters. Other algae have been boiled and made into puddings. Seaweed is also eaten in the British Isles. The use of seaweed for food is most highly developed in Japan. Nori, a red alga, is cultivated as a crop on nets or bushes set in quiet bays. In the past, Hawaiians have made use of a wide variety of seaweeds, and the most select varieties were grown in special ponds for the nobility.

Kelp, a brown alga, is the raw material for a gelatin used in many food products. The growing world population, coupled with the shortage of protein foods in underdeveloped areas, has stimulated interest in algae as a source of cheap protein. Flour enriched with protein extracts from algae has been used in baked goods. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

ACOUSTICS

"Underwater Acoustics: Volume 2," edited by V.M. Albers, Plenum Press, New York, 1967, 416 + xiii pp., indexed, illus.

This book is a compilation of lectures presented at the Second Institute on Underwater Acoustics, Copenhagen, 1966. It includes 18 lectures by outstanding scientists, each an authority in his field. The lectures and their bibliographies make the book an invaluable reference.

The subjects include: advanced transducers; underwater sound in marine biology and geology; frequency discrimination in the common seal; sound propagation in the presence of bladder fish; flow noise; sound propagation and ambient noise under ice; sound scattering; underwater sound in oceanography; internal waves, and transmission rates in underwater acoustic telemetry.

ENCYCLOPEDIA OF MARINE RESOURCES

"The Encyclopedia of Marine Resources," edited by Frank E. Firth, Van Nostrand, Princeton, N.J., 1969, 740 + xi pp., indexed, illus., $25.

A handy reference compiled in response to the demand for readily accessible information on rapidly expanding undersea frontier. It covers more than 125 topics of current interest, from abalone to underwater mining; it includes minerals, bio-dynamics, food production, at-sea freezing and processing, fishing gear and equipment, pollution, and farming the sea.

FISHING EFFORT

"The Concept of the Marginal Yield from Exploited Fish Stocks," by J.A. Gulland, article (J. Cons. perm. inte. Explor. Mer., Vol. 32, No. 2, Nov. 1968, pp. 256-61).

When fishing effort increases on an exploited stock, the increase in total yield (the marginal yield) is less than might be estimated from the product of the increase in effort and the catch-per-unit effort. Marginal efficiency is the actual increase percentage of the expected increase. It can be near 100% for very lightly fished stocks, and decrease to near zero, or become even negative, for heavily fished stocks.

Mr. Gulland examines marginal efficiency as a function of catch for 2 commonly used population models. He discusses the implication of the concepts of marginal yield and marginal efficiency for fishery management and for planning fishery development.

OCEANOGRAPHIC RESEARCH

"Oceanographic Ship Operating Schedules," available free from Marine Sciences Affairs Staff, Office of the Oceanographer of the Navy, Bldg. 159E, Rm. 476, Washington Navy Yard, Washington, D. C. 20390.

A list of planned schedules and areas of operation of 79 U.S. Government-owned or sponsored research vessels, and Coast Guard ships at 6 ocean stations, participating in the national marine science program from November 1969 to April 1970. Many are equipped to accommodate visiting scientists and additional instrumentation.

Expected cruise dates, areas, and type of work--fishery research, plankton studies, etc.--are given for each ship. Interested scientists may apply for available berth space directly to agency or institution operating specific ships. Research data obtained during cruises may be obtained from the National Oceanographic Data Center, Bldg. 160, Washington Navy Yard, Washington, D.C. 20390.

PESTICIDES

"Pesticides in Surface Waters of the United States: a Five-Year Summary 1964-1968," by J.J. Lichtenberg, J.W. Eichelberger, R.C. Dressman, and J.E. Longbottom, Department of the Interior, FWPCA, Analytical Quality Control Laboratory, Cincinnati, Ohio, Sept. 1969, 11 pp., 8 tables, illus.

A report on 5 annual synoptic surveys for chlorinated hydrocarbon pesticides showing widespread occurrences of such compounds. The most frequently detected were Dieldrin and DDT, and its close relatives DDE and DDD. The maximum concentrations found did not exceed permissible limits in relation to direct human intake from a domestic water supply--but they often exceeded the environmental limit recommended by the Federal Committee on Water Quality Criteria.

The tables show concentration percentages and their locations.

PRODUCTIVITY OF MAN-MADE LAKES

"Conference on the Ecological Aspects of International Development," by Julia McCaull, article, "Nature and Resources" (bull. of Int. Hydrological Dec.), Vol. 5, No. 2, June 1969, pp. 5-12.

The lack of mechanism for ensuring that the advance of technology brings desirable benefits, not disasters, has been strongly felt in many areas, especially in fisheries.

The biggest, and perhaps the most consequential, hydrological projects are those to control the great rivers of the world. The dangers of instituting such gigantic enterprises without adequate ecological planning is illustrated by the Kariba Dam on the Zambezi, and the high dam at Aswan. This article, a synopsis of conference papers, notes the adverse affects on fishing created by these dams.

Before the formation of Lake Kariba, government officials had predicted it would produce up to 20,000 tons of fish annually. The production did not materialize. In 1963, more than 2,000 fishermen took 4,000 short tons from the lake. In 1964, the yield was less than 2,100 tons and, by 1967, the lake supported only 500 fishermen. This drastic decline apparently was due to only partially understood ecological factors. Some of these are discussed in the article.

The Aswan Dam, which halted the flow of nutrients reaching the ocean, has destroyed the coastal sardine fishing industry. Five delta lakes fished commercially also appear less productive. Although Lake Nasser may produce catches exceeding those lost at the delta, a parallel is drawn between these expectations and the unfulfilled expectations at Lake Kariba.

Mr. McCaull also discusses the slow strangulation of Lake Valencia in Venezuela.

PUBLICATIONS

"Fishery Publications Index, 1955-64," Circular 296, Department of the Interior, Fish & Wildlife Service, May 1969. Sold by Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, $1.75.

This is a list of Fish & Wildlife Service fishery publications indexed by series, authors, and subjects. It includes popular, statistical, and scientific reports.

The following, published by the Fish & Wildlife Service, Department of the Interior, are available from Division of Publications, BCF, 1801 N. Moore Street, Arlington, Va. 22209:

PROCESSING

"Use of Sodium Tripolyphosphate to Control Fish Shrinkage during Hot-Smoking," by H. J. Barnett, R.W. Nelson, and J.A. Dassow, article, 'Fishery Industrial Research,' Vol. 5, No. 3, pp. 103-115, illus.

Moisture loss in hot-smoking (kippering) thawed halibut, salmon, and black cod results in economic loss as well as loss of quality. Because sodium tripolyphosphate effectively reduces loss of moisture in other foods, including fresh fish, it was tried with these smoked products and found effective in halibut and salmon.

The authors describe the procedures and results of their experiments and provide recommendations for industry trials.

SCALLOPS

"Explorations for Calico Scallop, Pecten gibbus, in the Area off Cape Kennedy, Florida, 1960-66," by Shelby B. Drummond, "Fishery Industrial Research," Vol. 5, No. 2, pp. 85-101.

Scallops, long have been considered a gourmet item in the U.S. Both bay and sea scallops are the basis of a thriving industry.

BCF exploratory vessels have discovered an immense, and little fished, bed of calico scallops off the east coast of Florida. The bed, in about 5 to 40 fathoms, covers 5,790 square miles, from about 11 miles south of Stuart, to about 6 miles north of St. Augustine. At the more favorable locations, the supply is adequate to support an almost year-round fishery. The area between Fort Pierce and the southeast shoal of Cape Kennedy was productive most consistently.

The bed is shown in 14 charts; catch rates are given for the entire grounds.

LEVELS OF RADIOACTIVITY IN SEAFOOD

"Consumption Trials and Edible Fractions of Various Commercially Important Species of Fish and Shellfish," by C.J. Barker, article, in J. Cons. perm. int. Explor. Mer., Vol. 32, No. 1, July 1968, pp. 117-22.

Consumption survey data are used to assess maximum permissible discharge rates for aqueous radioactive effluent from nuclear installations. To monitor the levels present in seafood, it is necessary to know the consumption rates for persons in an area, and to convert this into edible fractions.

Consumption survey data are usually in the form of average and maximum numbers, or weight of fish consumed. The figures can be converted to edible material by data from the consumption trials. The relative percentage of edible material in raw whole ungutted fish, or raw filleted fish, is determined.

Mr. Baker describes the methods, procedures, and results of trials on 11 different species.

--Barbara Lundy

WHAT IS BIOLUMINESCENCE?

Bioluminescence is light produced by living organisms, both animals and plants. In contrast to incandescent light, high temperatures are not necessary; oxygen, however, appears to be essential to the light-producing process.

Thousands of species of marine animals produce bioluminescence; most of them are animals of the lower orders. In addition to single-celled animals, various jellyfish and related animals produce displays. Among vertebrates, luminescence is found only in certain fishes and sharks.

Displays are seen most commonly in warm surface waters. Although most of the organisms are small, there are such immense numbers present that brilliant displays occur when the waters are disturbed by the passage of a ship at night.

Luminescent bacteria are present in sea water, but not in fresh water and can cause decaying fish to glow in the dark.

At ocean depths where light does not penetrate, there are strange-looking luminescent fishes. Beebe estimated that 96 percent of all the creatures brought up by nets were luminescent. There is controversy among biologists concerning the purpose of lights on marine animals. Some creatures have well-developed eyes but no light to enable them to see in the dark; others have brilliant light organs but are too blind to see. The property of luminescence is perhaps used as a defense against predators or as a means of hunting food or finding members of the opposite sex in the dark. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

INTERNATIONAL

FAO HOLDS CONFERENCE TO SPUR FISHERY INVESTMENTS

World-wide action to stimulate capital investment in the fisheries of developing countries was recommended by FAO's International Conference on Investments in Fisheries, held in Rome, September 18-25. About 150 representatives of government, industry, banks, and universities in 42 countries wound up the 6-day meeting calling for national and regional meetings to secure foreign financing for fishery projects in developing countries.

FAO Backing

Roy I. Jackson, FAO Assistant Director-General for Fisheries, promised full support. He said: "Where opportunities for promoting foreign-exchange-earning export industries exist, we would seek to interest private foreign investors, bilateral agencies and banks."

Objectives

Oris V. Wells, FAO Deputy Director-General, stated that in most of the developing countries, for the next decade at least, "the major battle will still be fought on the food front." Despite improvements in the general world food situation, he warned that population increase in the developing world is still between 2.5% and 3% a year.

Wells said that fish can contribute greatly to fulfilling human protein requirements. In many developing countries, it is "the cheapest source of strategic animal protein." In these countries, and in those deriving important foreign-exchange earnings through fish exports, fisheries would be emphasized increasingly in national development programs.

Wells added: "To meet the demand for more fish, for fish of a better quality offered at reasonable prices, investment in fish catching, processing and distribution will have to be expanded. . . . Finance will have to be found for new and improved facilities at sea and on shore, for manpower training, resources, and technological research and development."

Wells expected the conference to go far in identifying investment opportunities and proposing ways and means of exploiting them. It could evaluate techniques to promote improved investment planning, and ensure that scarce development resources were not squandered.

Information Problems

The delegates agreed that private, government, and international capital is available for worthwhile fishery projects, but the question is how to bring capital together. They emphasized lack of information on conditions and opportunities for investment.

To bridge the 'information gap,' it was suggested that FAO organize national and regional meetings as a 'brokerage function' to promote development. FAO already assists industry and agriculture through its investment center, the FAO/Industry Cooperative Program and Legislation Branch.

Clearing House

The delegates also suggested establishment of an 'international clearing house' to pinpoint opportunities and channel investments. Efforts must be made now to collect accurate information on investment opportunities, and scientific data on fishery resources--a prime requisite of good investment planning.

Representatives of international financial institutions stated that private financing was sound business, "not an adventure in altruism." They discussed opportunities for financing by private institutions and joint ventures into fishery enterprises.

Rising Demand for Fish

The delegates agreed that sound opportunities for investment exist. World fisheries are expanding steadily to meet growing food demands. The need for more animal proteins, especially in developing areas, is growing. Consumption is expected to double in the next 20 years. This will assure producers a reliable market. Developing countries recognize fisheries as a potential new source of export earnings.

World Fishery Bank Recommended

Creation of a world fishery bank to finance the industry, particularly in developing

countries, was recommended by B. M. O'Kelley, Chairman, Irish Sea Fisheries Board. He said bank should be part of a government-financed international fishery development corporation. It should be treated as an international industry, utilizing a "total industrial approach." The corporation would collect and disseminate marketing and technological information, and promote investments, particularly in less-developed areas. It would consult on investment problems, assist in identifying and promoting investment opportunities, and provide a "forum where investor and promoter could meet."

The suggestion was a fresh approach to "bridging the gap between the capital exporting countries and those less developed areas of the world where the populations live on the verge of starvation," Kelly said. Unlike industry or agriculture, fishing industry usually has trouble getting capital.

Other Suggestions

Prof. R. H. Barback of the U.K. said his government intends to increase overseas aid when the balance of payments situation improves. The aid would be given on a multilateral rather than a bilateral basis. Canada's L. J. Berube suggested that developing countries establish fishery cooperatives by forming state enterprises and transforming them into cooperatives once the share-owning fishermen acquire majority control.

Opportunities in Developing Countries

Several representatives from developing countries cited investment opportunities in their areas. L. Nhwani, a Tanzanian fishery officer, said his country, with a 500-mile coastline on the Indian Ocean, was fishing only one-tenth its potential. R. B. Williamson, chief fisheries officer of Malawi, noted Lake Nyasa's unexploited fisheries.

Mexico's A. Cervantes Delgado pointed out opportunities in Latin America. Fish is rarely eaten in many areas, despite the 'explosive' fishery development in countries like Peru.

Speakers emphasized need for developing marketing and distribution systems. One African speaker said that building a 20-mile road could mean difference between development and continued stagnation.

Future Plans

FAO intends to follow up the conference's work. It will hold one conference on the use of marginal fishery resources, like those in the Arabian Sea, and another on fishery education and training.

HORMONES STIMULATE FISH GROWTH

Fish culturists have found a new answer to sexual sluggishness in fish: treat them with hormones. Hormones are glandular secretions regulating growth, reproduction, and other vital body functions in humans and animals. Introduced artificially, they act like naturally produced hormones. Dr. T. V. R. Pillay, who heads the Fish Culture Section of FAO's Department of Fisheries, says hormones are used to increase carp production in Taiwan, India, and other Asian countries where carp is commonly grown for food.

Carp

A tasty, nutritious fresh-water fish, carp comes in several species; some of the best known are the Indian and Chinese. An Indian carp, the Catla, grows to about 6 feet and 140 pounds. Carp is a herbivore, hardy, compatible with other fish, and ideal for pond culture.

Spawning

Dr. Pillay points out, however, that Indian and Chinese carp do not spawn in still waters. "They normally spawn only in running water, especially after a heavy rainfall. In countries such as India and Pakistan. . .the Indian carp will breed in the rising waters of the flooding monsoons. In fact, farmers and fishermen in these countries build special ponds to trap the monsoon waters so as to recreate the conditions under which the fish will spawn."

Methods

Seeking an easier method, carp culturists have borrowed from medical knowledge by using hormones, both synthetic and natural, from the carp's pituitary glands.

Dr. Pillay explained: "The hormones are injected with a hypodermic needle into the shoulder or tail region of the fish. Normally,

two or three injections are given, both to male and female members of the species. The hormones stimulate the gland of the fish, inducing sexual maturation and spawning. Before injection, large fish may be treated with a tranquilizer to keep them calm and facilitate handling. The fish are placed in a tank containing water to which a mild tranquilizing chemical has been added. They may be laid in a special cradle to receive the injection.

"Since carp are very prolific--the larger females can lay millions of eggs during each spawning period--it is necessary to breed only a few fish to obtain the necessary number of fry for cultivation. The process is not expensive and adding hormones does not affect the fish's taste in any way."

Other Countries

Dr. Pillay says the process has been developed in a number of countries. In Brazil, it was used to breed local species. Fish culturists in Mainland China also are reported using hormones to stimulate reproduction.

So promising is the practice that FAO recently sponsored a Regional Seminar on Induced Breeding of Cultivated Fishes. The seminar, held in Calcutta, Cuttack, and Bombay, brought together culturists from 12 Asian and Far Eastern countries. Knowledge of hormone use might help boost fish production in those countries.

FRENCH TAG TUNA IN EASTERN ATLANTIC

Scientists aboard the French research vessel 'La Pelagia' tagged albacore, Thunnus alalunga, between 37° and 51° N. latitude and between the Continental Shelf and 20° W. meridian (off western Portugal, Bay of Biscay, and southwest Ireland), from June 5 to October 30.

Plastic and Metal Darts Used

The tags are Floy Tag FT-1 (plastic dart) and WH FM 67 (metal dart). They bear a yellow plastic strip with the words "Institut Pêches Maritimes Paris France-Récompense."

Tag Recovery

All recovered tags should be returned to the Institut Scientifique et Technique des Pêches Maritimes, 59 Avenue Raymond Poincaré, Paris 16, France, with the following information: date and place recaptured, type of fishing, size (from end of snout to the caudal fin), and weight, if possible. Fifteen French francs will be paid for all tagged fish recaptured. (FAO, Aug. 1969.)

3 NATIONS SURVEY BARENTS SEA

Five research vessels--one British, 2 Norwegian, 2 Soviet--sailed on a joint expedition to the Barents Sea in late August. Their mission was to estimate abundance of the 1969 year-classes of cod, ocean perch, and herring in the Barents and northeastern Norwegian Seas; also, to assess the maximum sustainable yield for 1972-76. An oceanographic survey will be carried out in the southwestern Norwegian Sea.

Will Report to ICES

When the surveys have been completed, participating scientists will go to Norway to prepare a report for the International Council for Exploration of the Sea (ICES). (TASS, Aug. 25.)

JAPAN AND SOUTH KOREA PLAN JOINT VENTURE

The Taiyo Fishing Co. of Japan and the Republic of Korea's government-owned Agriculture-Forestry-Fisheries Development Corporation are planning a joint fishery venture in South Korea. A joint company was scheduled to be established around the end of September. Taiyo will furnish the vessels, and the Development Corporation will construct a large processing plant.

Taiyo Trawlers Sought

Reportedly, Taiyo has been asked to provide three 500- to 900-gross-ton bottom trawlers and two 120-ton shrimp trawlers to be manned by South Koreans. They will fish in the Pacific, the North Atlantic, and on shrimp grounds off foreign coasts. ('Minato Shimbun,' Aug. 5.)

●○●●○●

PAIR SEINE NETTING PROVES GREAT SUCCESS

News of 5,000-10,000-pound catches of hake and sole in 1 hour has become commonplace around Prince Edward Island. These astounding results have been achieved by an entirely new technique, 'Canadian pair-seine netting.'

Similar to Spanish Pair-Trawling

The technique is similar to the 'pareja' pair trawling commonly used by large Spanish deep-sea trawlers in the north Atlantic. In the Canadian version, 2 110-hp. diesel engine 40-foot lobster boats tow a single net between them. The net is funnel-shaped, somewhat like a regular otter trawl, but with a higher vertical opening. Two winches, one on each boat, haul the net. The skippers, coordinating operations by radiotelephone, can make as many as 8 tows a day.

Inexpensive Conversion

Small-boat fishermen will find two great advantages in the new technique: the machinery and gear needed for vessel commission are relatively inexpensive, and the power requirements are low compared to those of regular draggers. It also will enable lobstermen to use their boats during the many off-season months. Other low-powered inshore vessels also can use the techniques.

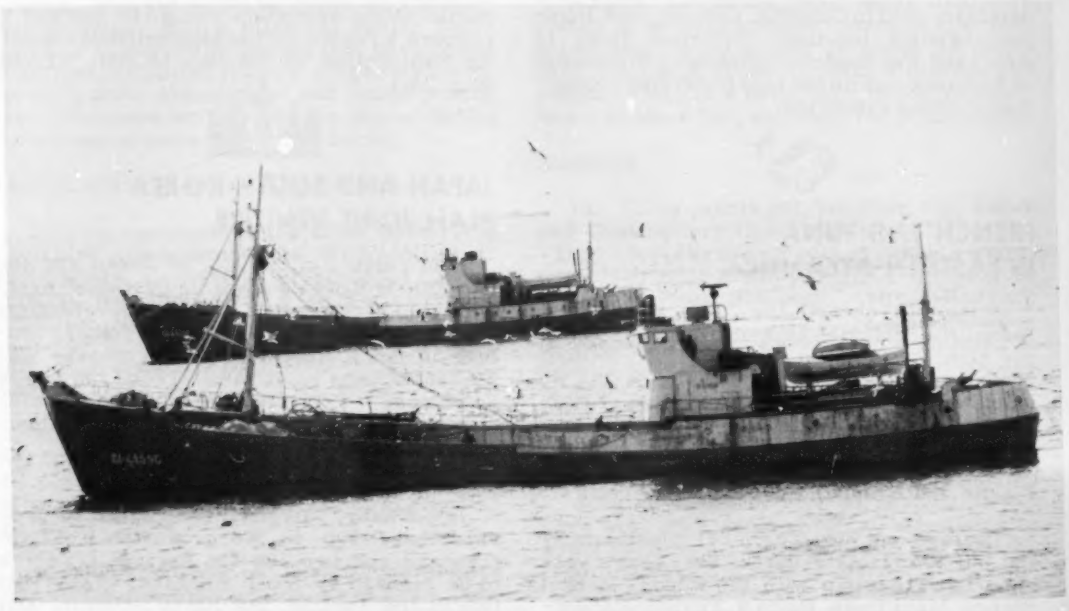
A full report, including machinery and gear specifications, and a description of the fishing method with diagrams, photographs, and catch records should be available shortly. (Dept. of Fisheries and Forestry, Sept. 12.)

* * *

FISHERIES MINISTER PROPOSES STRICTER SALMON LICENSING IN BRITISH COLUMBIA

The first phase of a scheme to limit salmon licenses in British Columbia (B.C.) became effective Sept. 6, 1968. It was intended to increase the earning power of salmon fishermen and permit better resource management.

Regulations expected to reduce fleet size and production costs divided B.C. salmon vessels into 3 categories: 'A' for those producing annually over 10,000 pounds, or a



Spanish pareja trawlers harvesting large codfish on easterly side of Georges Bank, Feb. 27, 1968.

CANADA (Contd.):

landed value of C$1,250; 'B,' producing less than 10,000 pounds; and 'C,' mostly for trawlers and crab boats not normally geared to fish salmon.

Fleet Size Cut

By June 15, 1969, the regulations had served to cut the fleet from 7,548 licensed in 1968 to 6,977--5,844 in category 'A,' 1,003 in 'B,' and 100 in 'C'. Net worth of the fleet in 1968 had been $87 million; though smaller in 1969, its value had risen to $95.6 million.

Other Phase I Changes

Under Phase I, the fleet added 255 newly built boats (already under construction on Sept. 6, 1968); 160 vessels that would have been 'A' did not renew their licenses; 70 'A' vessels were retired and replaced with new ones, and replacements were approved for 45 lost at sea.

Proposed Phase II Regulations

On Sept. 3, 1969, the Minister of Fisheries and Forestry, Jack Davis, proposed new regulations for Phase II. Under these, B.C. salmon fishermen would be hard pushed to keep their vessels in category 'A,' license fees would be higher, and a percentage of the landed catch value would be collected for predator control.

Phase II Proposals

1) To retain an 'A' license, vessel production must be equivalent to $20,000 for 4 consecutive years ($5,000 yearly average).

2) After 1971, if average annual production for any 4-year period falls below $5,000, the vessels drops into category 'B'. It will be frozen in 'B'. (Even if production improves, it will not be allowed to return to 'A'.)

3) An 'A' vessel must be retired before a new one can be built.

4) Any new vessel introduced into the fishery must assume an 'A' production.

5) Any vessel not reporting landings for 2 consecutive years will not be licensed in any category.

Fishermen Informed in Advance

When Phase I was announced, the initial cut-off was based on production prior to Sept. 6, 1968. Under Phase II, fishermen would be informed in advance how much production would be required to maintain 'A' license.

New License Fees

Under Phase I, the minimum license fee was $20: $10 for commercial fishing vessel registration, $5 for salmon fishing validation, and $5 for personal fishing license.

Under Phase II, the minimum would be $25: $10 for vessel registration and $15 for salmon. Beginning in 1970, 1% of the landed catch value would be collected for use in controlling such predators as dogfish. This collection will increase by 1% of landed value in each of following 4 years, up to a maximum of 5%.

Further Fleet Reduction Expected

The Minister said he expected the new proposals to knock about 50% of the present 'A' vessels down to 'B' and leave about 2,000-2,500 in 'A'. This class produces well over 80% of total salmon landings. (Dept. of Fisheries & Forestry, Sept. 3; CFR, Feb. & Mar. 1969.)

* * *

NEWFOUNDLAND LANDINGS IN FIRST-HALF 1969

Total Newfoundland landings for first-half 1969 were 499 million pounds, substantially more than the 456 million landed in same period 1968. However, a comparison of data for the first 2 quarters 1969 reveals that increases in first quarter were significantly high than in second.

Lobsters and Cod Decrease

While landings of many fish increased, landings of cod, the major Newfoundland species, dropped markedly. The lobster harvest also decreased. Closing Placentia Bay for several weeks during the second quarter, because of pollution, probably caused these decreases. Greenland turbot landings also decreased despite the new sales campaign launched in the U.S. The capelin decrease probably was due to reduced demand.

Increased Species

Increased landings of 5 species that did not warrant mention in 1968--lumpfish, mackerel, trout, mussels, and scallops--prove Newfoundland fishermen are willing to fish for previously unexploited species. Crab landings increased sharply, probably because of the new crab-processing facilities at the Bonavista Cold Storage Company. (U.S. Consul, St. John's, July 30.)

* * *

CANADA (Contd.):

GOVERNMENT BUYS SALT COD FOR FOREIGN RELIEF

The government was slated to buy a million pounds of salted cod, worth about C$365,000, from east coast suppliers for Canada's food relief program in developing countries.

This purchase would clear remaining 1968 stocks, and even take part of this season's production. Suppliers were to deliver the fish to Montreal between the 8th and 14th of October.

Salt Cod Highly Valued

Relief organizations consider dried salted fish a prime food because of its high protein value. Canada has provided substantial quantities in the past 2 years and may provide more later this year. (Dept. of Fisheries & Forestry, Oct. 8.)

* * *

CONFERENCE ON AUTOMATION & MECHANIZATION SLATED

In a rapidly changing fishing industry, the introduction of ultrasophisticated catching and processing equipment, and the advanced operating and maintenance skill such equipment demands, raise many problems. These problems will be studied at a Conference on Automation and Mechanization in the Fishing Industry (CAMFI) in Montreal, Feb. 3-6, 1970.

Main Objectives

The structure of Canada's fishing industry is undergoing drastic changes in response to increasing competition from other fishing nations, and the problems of growing capital investment and productions costs. The main objective of the conference is to show how to meet these challenges and to improve pay and working conditions.

To Aid Industry Modernization

Participants who can contribute to modernization of the industry will represent government, industry, science, engineering, and business. More than 40 will present papers on the application of automation and mechanization and on related subjects, such as new management techniques. They also will discuss the automated and mechanized equipment, the present new processes and production techniques, or those that will become operational within the next 5 years.

The conference has been planned to benefit the fishing industry, fishing-vessel builders, and producers of the machinery, systems, and equipment required on vessels and in shore-based plants. (CAMFI, Aug. 7.)

* * *

OCTOBER WAS FISH PROMOTION MONTH

October was National Fish 'n' Seafood Month in Canada. Due to heavy summer fishing, fishery product inventories usually peak in October, making it an opportune time for a promotional campaign.

As its contribution, the Department of Fisheries and Forestry distributed recipe-photo releases to newspaper editors and food publicists. A 4-minute sound-track, color film, 'Take a Pack of Frozen Fillets,' was sent to the television stations; a new recipe booklet, with the same title, was released nationally. Special short scripts were provided for radio food commentators.

Home Economists Helped

The Department's home economists, who constantly test and develop fish recipes, supplied a number of newly tested, quantity recipes to restaurants and institutions. They appeared on radio and TV throughout the country to demonstrate fish preparation. They assisted in local fishing industry-sponsored activities. (Dept. of Fisheries and Forestry, Ottawa, Sept. 8.)

EUROPE

USSR

PROPOSES DAM TO PROTECT AZOV SEA

The Azov Fisheries Research Institute (AZNIRKH) has proposed damming the Kerch Strait to protect and conserve the rich fishery resources in the Azov Sea. The Strait, 25 miles long and 2-9 miles wide, connects the Azov and the Black Seas. It will take 5-6 years to complete the project at a cost of 150 million rubles (US$165 million).

Increasing Salinity Threatens Fish

The future of the Azov fisheries is in jeopardy, according to AZNIRKH scientists. They fear that about half the freshwater runoff from rivers flowing into the Azov will be diverted for agricultural and industrial use by 1980. A diversion of this magnitude would increase salinity up to 16-18 grams of salts in each kilogram of water, a concentration too great for sturgeon, pike-perch, Azov roach and bream to withstand. Their foraging grounds would be reduced to a small area in Taganrog Bay, at the mouth of the Don River, forcing them to migrate to the Black Sea. The projected dam, regulating the influx of Black Sea water, would control salinity and conserve these commercially valuable species.

Value of Fishery

In 1968, the commercial yield of pike-perch and bream, spawning naturally in the Don flood plains (50 days in spring), amounted to 30,000 metric tons; the commercial yield of all fish-culture enterprises around the Azov was only 3,000 tons. The scientists claim that the Azov's high productivity can be maintained only if the Don spawning grounds remain intact, and the Azov foraging grounds are preserved.

Dam Specifications

AZNIRKH has proposed a dike encompassing a 440-meter spillway dam with 22 metal-gated openings, ensuring a water flow of 10,000 cubic meters a second. A lock 260 meters long and 38 meters wide would be provided for ship passage.

Other Problems

The AZNIRKH scientists warn that damming the Kerch Strait will solve only part of the problem of decreasing freshwater runoff. An unanswered question is how to supply the slats and other chemicals needed for evolution of feed organisms and fish reproduction. ('Vodnyi Transport,' Sept. 2.)

* * *

DEEP-WATER TRAWLING TAKES ANTARCTIC COD

The USSR has begun commercial exploitation of "Notothenia", a species of cod found only in Antarctic waters. Unable to survive temperatures above 6° C. (42.8° F.), it lives at a depth of 300 meters (984 ft.). Its average length is 60-80 centimeters (23-31 in.). Notothenia flesh is delicate and tasty.

New Freezer-Trawler Used

The fishery is conducted by the Northern Fisheries Administration's Murmansk trawler fleet. A recent arrival, the processing trawler 'Skazochnik Andersen' has been averaging 10-20 metric tons per haul. ('Vodnyi Transport,' Aug. 21.)

The Danish-built 'Skazochnik Andersen' is a 'Skryplev'-class vessel of about 4,700 gross tons. This class combines processing freezers and stern trawlers.

* * *

VESSEL SEEKS SHRIMP OFF AFRICA

Anticipating a shrimp expedition scheduled to leave the Baltic port of Klajpeda on September 12, the medium trawler 'Skakhtersk' (Western Fisheries Administration) has been scouting commercial shrimp concentrations "off the coast of Africa" (presumably Mauritania, Senegal, and Guinea).

Using Echo Sounder

The vessel is equipped with an 'Omar' echo sounder, the first time Omar has been used to locate shrimp concentrations. Operating at high frequency, Omar can reveal fish concentrations down to 200 meters (650 ft.); operating at low frequency, to 400 meters (1,300 ft.). Working frequencies are 150 and 25.5 kilocycles a second. Shakhtersk also carries a new echo sounder, 'Zvuk-100M.' ('Vodnyi Transport,' (Aug. 23, 1969, and 'Sudostroenie,' No. 9, 1967.)

USSR (Contd.):

In the past, Soviet shrimp catches from West African waters have been exported to the U.S. via the Canary Islands.

* * *

CARP AND PIKE BRED IN RESERVOIRS SUPPLIED WITH THERMAL WATER

A reservoir near Moscow is being supplied warm water by an electric power station. Fish raised in the reservoir have yielded 380 metric tons per hectare (2.47 acres), 600 times the yield of conventional fish-culture ponds. Their breeding areas were staked out with metal or synthetic fiber nets.

Allows High Growth Rate

The warm water prevents the reservoir from freezing over, even during the most severe winter. Roes of carp, pike, and other fresh-water fish can be started in special incubators in early spring. During the winter, 'insignificant' amounts of phytoplankton and other feed cause carp yearlings to grow 10%. ('Ekonomicheskaia Gazeta,' No. 34, Aug. 1969.)

No time period for measuring growth rate was given. Such growth would be remarkable in winter, when carp and other fresh-water fish either grow very little or not at all.

* * *

ARTIFICIAL CULTURE OF SEA CUCUMBERS & SCALLOPS BEGINS

Artificial culture of sea cucumbers in the Bay of Peter the Great, off Vladivostok, has been slated by the Soviet Pacific Research Institute for Fisheries and Oceanography. The Institute also plans to expand artificial culture of scallops in the same area. ('Vodnyi Transport,' Aug. 19.)

* * *

BATHYSCAPHE USED TO STUDY BEHAVIOR OF FISH IN TRAWL NETS

Soviet researchers studied the behavior of fish (horse mackerel and sardinella) in trawl nets in the Gulf of Mexico, January-April 1968. The 'Muksun' towed a bathyscaphe (Atlant-1) at 30-60 meters (98-197 feet) during daylight hours. No artificial light was used.

Fish were observed schooling ahead of the trawl opening. Some entered the net; some moved away in the direction of the trawl faster than trawl speed, 2.06-2.21 meters per second--at a rate of about 20 fish per cubic meter in area of trawl square. Fish inside the bag escaped the net at a rate of 40-50 per cubic meter. Entry into and exit from the trawl net were orderly while the trawl was open. Fish caught inside the trawl as it closed tried to escape through the meshes.

Factors Affecting Fish Behavior

Both visual and nonvisual stimuli appear to govern fish behavior near trawl nets. In turbid waters, or at night, the lateral line (a sensing organ) appears to control the fish's behavior, although luminescent organisms may reveal the nets.

Trawls with 150-millimeter and 100-millimeter wing meshes yielded almost identical catches. ('Rybnoe Khoziaistvo,' No. 7.)

* * *

FINDS JAPANESE ACOUSTICAL DEVICES UNSATISFACTORY

The Far-Eastern Fisheries Administration bought 21 acoustical gear-monitoring and fish-locating devices from Japan in 1968. Some of these had been made by Furuno. The devices, installed on the BMRTs 'Samarga,' 'Chernopiatko,' 'F. Krainov,' 'Tret'iskova,' 'Kazakhstan,' and 'Taishet,' were used in midwater trawling for Pacific hake.

E. German Devices Better

Soviet experts claim the Japanese devices compare unfavorably with similar East German devices. They suggest that the latter be used on new Soviet fishing vessels. ('Rybnoe Khoziaistvo,' No. 7, 1969.)

* * *

PURSE SEINING WITH ELECTRIC LIGHTS MAY BE DEVELOPED

A recent article in the official organ of the Fisheries Ministry indicates that the Soviets may be developing large-scale Pacific herring purse seining with electric lights.

USSR (Contd.):

Little is known about herring behavior under electric light, but experience seems to indicate that the species reacts positively. One Soviet purse seiner, on a fishing trip off Magadan (Okhotsk Sea), caught 10 metric tons in 1 haul using electric lights. ('Rybnoe Khoziaistvo,' No. 5, 1969.)

* * *

FISHERIES MINISTER PROMOTES 'MINCED FISH'

At a luncheon in Moscow, Fisheries Minister Ishkov and VNIRO Deputy Director Moiseev predicted a 100,000-150,000 metric ton annual minced-fish production in the 'immediate future.' Guests were served 26 different dishes prepared from minced fish.

Processed At Sea

Prepared from cod, hake, pollock, and snapper, the minced fish is wrapped in plastic bags and frozen at sea. It maintains a 'fresh fish' quality for 6-8 months. Since the average trip for a Soviet fishing vessel from port to fishing grounds is about 4,000 miles, most catches are processed at sea. Introduction of this new minced fish product could increase tremendously the output of edible fishery products. ('Vodnyi Transport,' Aug. 8.)

DENMARK

FIRST-HALF 1969 LANDINGS DROP BELOW 1968 RECORD PERIOD

Danish landings during the first 6 months of 1969 were running about 18% behind the record 1968 production.

Landings for fish meal and oil were down 24% due to poor weather early in the year. About 80% of the landings are used for meal. The fishery began in early January last year; this year's did not really begin until April. The season has not been as good and, even if the remainder of the year should be unusually good, the loss can not be made up. The drop in catch has caused a marked drop in production. Exports of fish meal amounted to 62,434 metric tons in first six months of 1969 (75,025 tons in first-half 1968).

Cod

Cod, the principal species used in export fish blocks, was about 9% below 1968. Danish exporters again have entered the U.S. market in great volume. Exports had dropped last year because of a U.S. price drop. Prices again are near former levels; about half the cod fillet production probably will be marketed in the U.S. Danish exporters are optimistic, U.S. consumption appears to be increasing, and there is some evidence of a decline in the Northwest Atlantic cod fisheries.

Landings of Principal Species--Jan.-June 1968-1969

	January-June		Calendar Year
	1969	1968	1968
	(Metric Tons)		
Plaice	21,956	20,492	50,242
Cod	59,087	64,914	107,390
Haddock	2,911	2,732	5,789
Herring for consumption	25,371	19,924	49,259
Salmon	747	849	2,089
Norwegian lobster	377	504	1,737
Deepwater shrimp	2,406	3,215	5,175
Other foodfish	22,752	23,532	61,058
Industrial fish	410,664	533,392	1,159,000
Total	546,271	669,554	1,441,739

Other Species

While cod fillets have been Denmark's principal export to the U.S., exporters are succeeding in marketing more plaice fillets. Denmark has large supplies of these and now is less able to market them effectively in England. Plaice landings increased by 7% this year. Landings of Norwegian lobster and shrimp, items in great demand in Europe, decreased during first-half 1969.

In all probability, the catch will continue to run below last year's, when weather permitted the greatest number of fishing days ever experienced. Should prices for cod fillets continue near present levels, or increase by a cent or two as some exporters anticipate, the added incentive would attract greater effort to the fishery. This would cause the catches to rise and more cod to be diverted from other uses. (U.S. Embassy, Copenhagen, Sept. 12.)

* * *

FAROESE CATCH DECLINES FURTHER

The 1968 Faroese catch declined more than 7,000 metric tons (4.41%) from previous years. The catches have declined steadily since 1962--to date, a total loss of 35,000 metric tons.

DENMARK (Contd.):

Both Greenlandic and Faroese waters yielded considerably poorer catches than before. The decrease was noted especially in the line-and-trawl fishery--although there was a 50% increase at one point in spring due to favorable weather and more vessels fishing.

Demersal Catch

Icelandic fishing areas no longer influence the demersal catch: only 5% of the demersal catch was taken off Iceland; the largest catches were made off Greenland. In 1968, demersal catch was 47.8% of the total; it had been 62% in 1967. The Newfoundland bank fishery has shown little growth since 1968, barely over 1,000 metric tons.

Herring Fishery

The herring fishery failed completely for gillnetters; power bloc trawlers were more successful. But total catch was still less than in 1967. The fishery failed entirely in home waters; catch declined 13,000 metric tons. No herring were caught off Iceland.

Trawler landings of fresh fish in Denmark more than doubled--15,392 metric tons compared to 6,318 in 1967. Foreign-vessel landings increased slightly.

Utilization & Production

As in previous years, only a small part of the catch was canned. Fish meal production rose slightly. Dried-cod production rose more than 1,000 metric tons. Spiced-herring production was the smallest in 16 years. Herring-oil production rose to more than 4,000 metric tons. ('Børsen', July 24.)

* * *

HIGH-SEAS SALMON FISHING INCREASES

About 30 Danish vessels caught around 350 metric tons of salmon off the coast of Norway from April to June (25 vessels and 140 tons for same period 1968). About 100 Norwegian vessels took part this year, catching about 400 tons (100 tons in 1968).

The Greenland Salmon Fishery

Last year, early reports had indicated that 20 vessels were going to fish salmon off Greenland; only about 9 actually went. Preliminary reports have indicated that more will try this year. Industry sources reported as many as 30 cutters being readied. Some are new and larger refrigerated vessels. The season is expected to continue into early December.

Encouraged by recent high-seas fishing successes, one vessel operator was planning to visit Japan in September. He hoped to learn more about methods of fishing tuna, swordfish, and porbeagle, with an eye to fishing off the Canary Islands. To enter this fishery, Danish fishermen would have to go only one-fourth the distance they cover going to Greenland. Should this materialize, it would take some pressure off the salmon. (U.S. Embassy, Copenhagen, Sept. 12.)

* * *

MINIMUM PRICES TO BE ESTABLISHED

In answer to a long-standing demand, Denmark passed a law in June 1969 establishing a system to fix minimum prices for first-hand sales of unprocessed fish landed in Danish ports. These minimums are to be established for cod, plaice, mackerel, and herring.

Industry & Government Unable to Agree

The Fisheries Minister, after negotiating with a committee of industry representatives, will determine minimum prices of fish for human consumption and fish for meal and oil. The committee, established August 11, has not been able to reach agreement. The system meets the wishes of most fishermen, who have run a system of their own for the last 2 years; but it fails to meet demands of many others, particularly from Esbjerg, for direct subsidies. The Minister, supported by 2 fishermen's unions, has resisted such demands.

Fishermen Dissatisfied

The fishermen are dissatisfied with the existing situation because expenditures for gear and equipment have been unusually heavy, catches have been down, and prices have been disappointing. (U.S. Embassy, Copenhagen, Sept.)

NORWAY

BRISLING CATCH IS SMALLER THAN EXPECTED

The good brisling season expected this year did not materialize. When fishing started on May 22 catches were reasonably good in the northern areas. In the southern areas that normally provide the bulk of the catch, the yield was disappointing. Things may have improved when areas where brisling had not yet met the required specifications were opened to fishing.

Pack and Stocks

Up until June, all the packers' raw material demands had been met--both the direct processing, and for deep-freezing in shore-based plants and on freezing vessels. By mid-June, brisling receipts had yielded about 160,000 cases. Total pack--brisling and sardines--was slightly in excess of same period 1968, but stocks were about 15% short.

	1967	1968	1969
	.... Cases (100 $\frac{1}{4}$ cans)		
Brisling	186,000	176,000	138,000
Sild	410,000	485,000	419,000
Kippers	122,000	108,000	111,000
Soft herring roes	42,000	30,000	17,000

Summer Herring

The fleet was prepared for the summer herring expected in waters near Bear's Island. A modest 15,000 barrels a few years ago, this year's target had been boosted to around 200,000 barrels in response to industry's demand for raw material to process into gafflebiter and similar products. Fishing was scheduled to start July 1, 10 days earlier than in 1968. (Norwegian 'Canners Export Journal,' July 1969.)

ICELAND

INCREASES SALMON HATCHERY

Salmon breeding is to be stepped up in Iceland's 10 fish hatcheries. During 1969, about 200,000 fry will be planted in the rivers and lakes. Obstacles have been cleared from some to make them more accessible for spawning. ('Atlantic and Iceland Review,' No. 2, 1969.)

FRANCE

FISHING FLEET DWINDLES

The French fishing industry is in trouble. Landings in 1968 were down 2% from 1967. Finfish fell 7%, and cod 11%. Wholesale turnover declined 0.2%.

Tonnage Decreases

During 1968, 98 fishing craft were laid up. This meant active vessel tonnage dropped 22,000 tons, about 10%. Under France's Fifth Plan, new vessels were to be added to the fleet at a rate of about 20,000 tons a year. But new vessels aggregated only 11,400 tons in 1967--and a mere 3,800 tons in 1968.

Exports Shrink, Deficit Rises

The negative balance of trade in fish and fish products has persisted. In 1968, imports increased 16% while exports decreased 11%. Only 13% of running costs were covered. The industry's deficit was about US$127 million, 5 times more than a decade ago. ('Fishing News,' London, June 13.)

* * *

SUBSIDIES GRANTED TO DRIED COD INDUSTRY

The government has granted a US$280,000 subsidy to FOMOR, the organization responsible for cod exports. FOMOR claims the subsidy is necessary because of cod stocks accumulated in the drying plants during 1968.

The accumulation, resulting from a drop in market prices, amounted to about 13,000 metric tons on December 15, 1968. It increased shortly afterwards, when 31 distant-water trawlers landed another 15,000 tons.

Subsidizes Export Drive

The subsidy is to help FOMOR make a real drive for increased exports at a time when neither trawler owners nor fish dryers can finance it. Already, they are unable to maintain the existing export level without government help because foreign competition is quoting lower prices on the world market. ('World Fishing,' London, July 1.)

UNITED KINGDOM

DOGFISH IS BECOMING POPULAR

Some fishermen and biologists are losing their dislike of the small sharks known in Britain as "rock hounds." It seems that dogfish can fetch fairly high market prices. Early this year, at Billingsgate, small skinned dogfish brought 21-26 U.S. cents a pound, while the larger ones sold at 26-29 cents.

Increasing Rates

British dogfish catches have increased steadily since 1960. Scottish 1966 landings were almost 5,000 long tons, compared to a mere 1,000 tons in 1954. Dogfish catches in England and Wales also have increased; their combined landings will top 6,000 tons. This means that U.K. fishermen catch over 24 million pounds a year.

May Need Conservation

Despite good demand for these "mini-sharks," fishery experts are concerned about declining stocks. It is believed that British catches have reached their peak, and the introduction of conservation measures has been suggested. This would be strongly challenged by many fishermen. If dogfish becomes more popular in many markets, its value will increase.

Popular in Europe

Fish-and-chip shops absorb large quantities. European fishmongers sell substantial quantities of dogfish steaks. Some Norwegian, German, and French connoisseurs consider it a table delicacy.

There are 4 species of dogfish in British waters; one is very rare. The spurdog, or piked dogfish, and the lesser spotted dogfish are the most common. These are the ones usually found in deep-sea trawling nets. ('Fish Trades Gazette,' May 31.)

* * *

WHITE FISH AUTHORITY RAISES INTEREST RATE

The White Fish Authority has announced rates of interest on loans made after August 23.

Loans for fishing vessels, new engines, nets and gear:

Less than 5 years--10$\frac{3}{8}$% ($\frac{1}{4}$% increase).

More than 5 but less than 10 years--9$\frac{5}{8}$% ($\frac{1}{8}$% increase).

More than 10 years but less than 15 years--9$\frac{3}{8}$% (no change).

More than 15 but less than 20 years--9$\frac{3}{4}$% ($\frac{1}{8}$% increase).

Loans for processing plants:

Less than 5 years--11% ($\frac{1}{8}$% increase).

More than 5 years but less than 20 years--10$\frac{3}{4}$% (no change).

The rates on loans made before August 23 are unchanged. ('Fish Trades Gazette,' Sept. 6.)

GREECE

FOREIGN TRADE TRENDS

In 1968, Greece imported 31,702 metric tons of fishery products worth US$12.9 million. In 1967, she had imported 28,962 tons worth US$11.5 million.

Fishery exports in 1968 dropped from 1967; however, 1968 export value was slightly greater because of higher prices for fresh and frozen fish. ('Alieia,' July 1969.)

LATIN AMERICA

MEXICO

FISHERIES DECLINED IN FIRST-HALF 1969

Mexico's fisheries declined 1.4% in first-half 1969 from first-half 1968. Oyster production increased markedly (47.4%), sardines 56.4%, and fish meal 58%, but shrimp was off 14.8% and anchovy 86.9%.

Fish Production, Jan.-June 1967-69

Species	1969 1/	1968	1967
	(Metric Tons)		
Shrimp	12,478	14,643	16,164
Oysters	17,718	12,018	10,316
Sardines	22,063	14,107	14,709
Anchovy	1,488	11,325	10,000
Mackerel	4,531	4,259	3,692
Grouper	2,854	2,136	1,812
Abalone	1,154	1,463	1,003
Lobster, spiny	590	485	766
Other	34,830	42,427	33,395
Industrial Products:			
Kelp	15,337	14,381	10,001
Fish Meal	8,517	5,390	5,035
Other	2,102	2,814	2,533
Total	123,662	125,448	109,426

1/Preliminary figures.

Shrimp exports (principally to the U.S.) were valued at 227 million pesos (US$18.16 million), down 12.4% from 1968. Shrimp dropped to 9th place in export value--after cotton, sugar, corn, coffee, tomatoes, petroleum products, fruits, and sulphur. Only continued high prices kept shrimp from falling even lower.

Record May Improve

Since the Gulf Coast's best production months were still ahead, this downward trend in production and exports may still reverse. (Regional Fisheries Attaché, U.S. Embassy, Mexico, Sept. 13.)

* * *

DECLINE EXPECTED IN WEST COAST SHRIMP FISHERY

The 1969/70 west coast shrimp season opened September 15. Both industry and government are pessimistic, expecting a continuation of last season's diminished catch. Measured by exports, the 1968/69 catch dropped 35%; it is not expected to recoup this season.

Reasons for Decline

Various reasons are given for the decline: unfavorable climatic and oceanographic conditions, aging vessels, and poor management. A further decline will be hard on an industry that needs new vessels and must finance them with earnings from shrimp sales.

Industry representatives now seeking foreign capital for new shrimp trawlers may be successful. (U.S. Embassy, Mexico, Aug. 15.)

* * *

SHRIMP RESEARCH CONDUCTED ON WEST COAST

The Directorate General of Fisheries, in cooperation with the fishing industry, has begun intensive shrimp resource studies on Mexico's west coast. Eight shrimp vessels have been provided by shrimp cooperatives, and 2 by private owners. A systematic plan of studies, designed by the Mexican National Institute for Research in Fisheries Biology, began on July 17.

The Operation

An area from Rio Colorado to Teacapan, south of Mazatlan, has been divided by a line at Rio Mayo. Two boats in the northern half and 2 in the southern are fishing about parallel to the coast, sampling the stocks at 4 depths. Two other boats are working intensively in each of 3 specially selected limited areas. The vessels use normal fishing gear and each carries a biologist and a fishery technician.

Special Work Done

The coastal research will be supplemented by special work, including shrimp marking, in the areas' estuaries and lagoons. Oceanographic observations from two fishery inspection vessels should further supplement the work. The total effort is expected to add considerably to the knowledge of the distribution, identity, composition, and dynamics of the shrimp stocks--and of certain valuable finfish stocks.

MEXICO (Contd.):

Research Goals

The cooperatives and boat owners are meeting all vessel operating costs and part of the research costs. The research may help government and industry to understand better the west coast shrimp and fish resources, and lead to increased and more-stable production (U.S. Embassy, Mexico, Sept. 3.)

* * *

SHRIMP VESSELS TO GET NEW REFRIGERATION PLANTS IN U.K.

Over 100 Mexican shrimp vessels are to get new refrigeration plants. The plants, to be installed in Great Britain, will cost US$4.8 million.

The new plants will ease distant-water operations, better shrimp quality, and improve catch preservation during long trips. The catch will be cooled in 2 seawater tanks, and then stored in cold-storage rooms at 0° C. (32° F.) ('Børsen,' June 18.)

* * *

FISH MEAL PLANT AND SARDINE CANNERY ARE BUILT IN GUAYMAS

Construction of a fish meal plant and a sardine cannery has begun in Guaymas, Sonora.

The fish meal plant, Industrializadora de Productos Marinos, S.A., will be Mexico's largest. It will have an hourly capacity of 18 metric tons of raw fish, or a potential daily output of 70-80 tons of fish meal. Equipped with rebuilt U.S. machinery and designed with U.S. advice, the new plant should be completed by the end of the year. Intended to exploit the Gulf of California sardine and anchovy resources, it should substantially reduce Mexican fish meal imports (51,683 tons in 1967).

The Cannery

The cannery, Empacadora del Pacifico, S.A., will have a daily capacity of 30 to 40 tons of raw fish. Although primarily for sardines--tuna and shrimp may be included when appropriate. Substantial amounts of sardines have been caught around Guaymas. They have been headed and gutted locally, and shipped, fresh in ice, to be canned in Ensenada. The new cannery should eliminate most, if not all, of this long, expensive routing.

Private Operators

The two plants, financed entirely by private Mexican capital, not by Banco Nacional de Fomento Cooperativa (BANFOCO). BANFOCO acquired most of the fish-processing plants on Mexico's West Coast in 1967.

The plants will employ more than 300 persons. Refrigeration and storage facilities will be expanded to accommodate the new plants.

Shrimp Port Diversified

Guaymas fishing circles hope that the diversification in this nearly exclusive shrimp port will help to offset bad shrimp seasons like the one in 1968/69. (U.S. Embassy, Mexico, Sept. 13.)

* * *

VERACRUZ FISHERIES

In first-half 1969, Veracruz landings rose 6% in quantity and 22% in value over same period 1968.

The new director of the Centro Nacional de Ciencias y Technologias Marinas (Veracruz Marine Science and Technology Center), a Japanese-Mexican marine biologist, Dr. Luis Kazuga, has announced an ambitious program to improve the fishing industry. Mexican fishing interests in Veracruz are conducting considerable fishery experimentation and instituting technical improvements in hopes of increasing operational efficiency and production. Japan is furnishing much technical assistance, and Spain is cooperating.

Net Installations Studied

For several months, Japanese specialists have been offering instruction in modern fishing techniques to local fishermen and to those from the Puerto Piloto Pesquero (PPP) in Alvarado. One of their projects is a feasibility study of permanent net installations along the coast. Before placing the nets, the Japanese will assist local fishermen in studies of the area's currents and marine life.

MEXICO (Contd.):

The first experiment, with a Japanese-built stationary net, produced promising results in late March. Placed about 2 or 3 kilometers off the coast of Mocambo during the spring mackerel run, it produced a catch worth US$40,000. A larger net, valued at $60,000, installed at the same location on July 1, caught 2 tons of fish worth $480 on the first day. Plans to instal other nets have been postponed until the Japanese can study the technique's effectiveness.

'Bacalao' Cod Fishery

Between November 1968 and April 1969, Mexican and Spanish fishermen caught 80 tons of cod in the northwest Atlantic. Under a Spanish-Mexican agreement, the Mexicans are to take over operation of the Spanish-built boats as soon as the Mexicans have acquired sufficient capability.

The cod were landed in Coatzacoalcos and shipped to Alvarado for initial processing. The fish were then taken in refrigerated trucks to Mexico City to be made into bacalao (salt-cod) by Empresa Bacaladera Mexicana S.A. de C.V. The company has established operations in Coatzacoalcos partly because of high labor costs in Veracruz, and partly because the port of Veracruz lacks the facilities to load fish directly from vessels into refrigerated trucks. Coatzacoalcos is 325 kilometers south of Veracruz, and 750 kilometers from Mexico City.

Cooperatives Planned

The Governor of Veracruz plans to establish 5 fishing cooperatives in various parts of the state to improve the marginal operations of individual fishermen. Thirty-five fishermen in the Boca del Rio area already have formed the first cooperative. The Banco de Fomento Cooperativa (BANFOCO) will provide funds to build a 70-ton refrigerated warehouse and to buy equipment. The Cooperatives will receive technical assistance from, and sell their catches through, the PPP in Alvarado.

Vessel Construction

Astilleros de Veracruz, S.A. (AVSA) has several new contracts to build shrimp boats. Venezuela has ordered 10 small boats at a total cost of US$124,000. Iran has contracted for 15 boats at US$108,000 each. AVSA laid the keel of the last of 15 shrimp boats previously ordered by PPP on June 17, and delivered the third completed one on the same day. AVSA hopes to deliver all 15 by the end of the year, but it is doubtful that more than 8 will have been completed by then.

BANFOCO is drawing up a new US$2.4 million contract for AVSA and a shipbuilding firm in Tampico to build 50 shrimp boats for PPP. If the contract goes through, PPP will have a fishing fleet in several years capable of fully using its facilities. (Reg. Fish. Attaché, U.S. Embassy, Mexico City, Aug. 16.)

PERU

FISH MEAL OUTPUT & EXPORTS, JAN.-JULY 1967-69

Fish meal production was low in July because fishing was restricted to the southern port of Ilo. Exports were high; most went to the U.S. and western Europe.

The 1968/69 anchovy season closed May 31, 1969. The 1969/70 season opened September 1. Sources reported average catches of 35,000 metric tons a day. If the catch continued at this rate, September fish meal production would be about $\frac{1}{3}$ below the September 1969 production of more than 257,000 tons.

Fish Meal Production & Exports, Jan.-July 1967-1969

	1969	1968	1967
	(Metric Tons)		
Production	1,011,111	1,048,873	1,029,766
Exports	1,234,130	1,255,190	883,398
Stocks on hand July 31	139,714	361,977	504,818

New Rules

The Instituto del Mar had not established a quota for the new season by Aug. 21, although a quota of 8.5 million tons and a closed season or "veda" in Jan.-Feb. had been recommended. No fishing will be permitted on Saturdays and Sundays. Also, fishing will be suspended at any port where half, or more than half, of the fish caught is less than 12 cm. long. (Sociedad Nacional de Pesqueria, Circ. 2180, Aug. 21.)

ECUADOR

TUNA PRODUCTION & EXPORTS DECLINED IN 1968

Tuna, Ecuador's most important fishery, seems to experience alternating good and bad years. In 1968, the tuna catch declined 10% from the 1967 record of 20,100 metric tons. This accounted for about 60% of overall reduction in exports of fish and fish products in 1968. About 90% was bonito, Euthuymus pelamais, nearly all caught within 20 miles of shore.

Tuna Production & Exports, 1966-68			
	1968	1967	1966
	(Metric Tons)		
Landings (live wt.)	18,202	20,127	11,968
Exports, frozen tuna	6,884	9,941	5,019
Exports, canned tuna, bonitos, skipjack, etc.	1,600	2,500	1,700

65 Pole Boats

The fleet remained relatively static--about 65 pole boats (none over 20 tons) and 6 small purse seiners. Two of the purse seiners are the only tuna vessels equipped with brine tanks.

Frozen Tuna To U.S.

Eighty percent of tuna export is shipped frozen, the remainder in 24-lb. institutional canned packs (mostly 1- or 4-pound cans). All frozen tuna is shipped to the U.S., primarily to Puerto Rico. About 90% of canned tuna, packed in brine, is shipped to U.S., the remainder goes to other countries. Some shipments made to Brazil are packed in soybean oil in $\frac{1}{2}$-lb. cans; the cans and oil are imported from U.S. Ecuador levies tax of 4 centavos (about $\frac{1}{5}$¢ U.S.) a pound on frozen tuna exports. (U.S. Consulate, Guayaquil, Sept. 2.)

* * *

1968 SHRIMP CATCH & EXPORTS SET RECORDS

The 1968 shrimp catch was 6,101 metric tons, a record for Ecuador. About 70-80% was medium and large white--primarily Penaeus occidentalis, with some P. stylirotris and P. vannamei. These were headed at sea. The remainder was small titi, Xiphoneneus, pomada, Protrachypene precipua, and some tigre, Trachypeneus byrdi, T. favea, T. similus pacificus. These were landed heads-on, unpeeled.

Most Caught in Guayaquil Gulf

Most shrimp are caught in Gulf of Guayaquil; the rest within 10 miles off Playas and Manat. The season lasts 12 months. The deep-water red shrimp, P. brevirostris, still eludes local fishermen. In time, the large vessels probably will find and exploit the beds.

Shrimp Fleet

Industry sources estimate the fleet has expanded from 174 boats to 195. Catch per boat has dropped despite record catch.

About 75 boats are 65 feet long or longer, mostly wooden hulls, and cost about $35,000 to build. Only two have steel hulls. Each is 75 feet long and was built in Ecuador for about $125,000.

Brine Refrigerated Tanks

About 70% of the fleet, including almost all larger vessels, have refrigerated brine tanks. Average trip time for larger vessels is about 2 weeks; the smaller boats, operating off Manta and Playas, return to port daily.

Shrimp Production & Exports, 1966-68			
	Catch Live Wt.	Exports	
		Value	Quantity
	Metric Tons	US $1,000	Metric Tons
1968	6,600	2,144.7	2,900
1967	6,000	2,229.0	2,700
1966	5,300	1,953.7	2,400

Exports

Nearly all the processed shrimp is exported to the U.S. It is shipped in 5-pound cartons, ready for market. The Ecuadorean government levies an export tax of 19 centavos (about 1U.S.¢) per pound. (U.S. Consulate, Guayaquil, Sept. 2.)

KOREA RAISES ISSUE OF JAPAN'S IMPORT RESTRICTIONS

S. Korea requested a broad reappraisal of Japanese tariff policies and import restrictions at the Japan-S. Korea Trade Conference in Tokyo, August 19-21.

Hoping to halt a growing imbalance of trade, Korea asked Japan to lower import duties on more items, reduce tariffs on 27, and eliminate certain other import restrictions. She also asked for more favorable regulations on laver imports and marketing, and reduction or elimination of tariffs on nonedible seaweed, squid, and salted sea urchin. Japan conceded only the 5% duty on certain types of nonedible seaweed.

Objects to Laver Import Restrictions

S. Korea objects particularly to the import procedures for dried laver. (In 1968, dried laver accounted for 51.6% of the value of all her marine-product exports to Japan.)

Japan permits Korean laver imports only between April and September. Furthermore, the sale price is not established until shipments have been completed and quality determined. Korea called this discriminatory and inconsistent with cordial commercial relations. Japan replied that her domestic producers must operate under the same system (30% of Japan's coastal fishermen harvest laver) and refused to change the procedures.

Value of Korean Marine Products Exports to Japan in 1967 and 1968

Item	1968	1967
	(US$1,000)	
Fresh or Frozen:		
Tuna and skipjack	1,145	1,142
Spanish mackerel	2,489	2,623
Shrimp	2,867	2,769
Other	4,147	4,056
Dried, Salted or Smoked:		
Sea urchin roe	880	1,357
Squid	1	1,317
Other	420	380
Fish Preparations	804	2,510
'Kanten'	761	3,553
Dried Laver	16,536	10,901
Other	2,032	1,808
Total	32,082	32,416

Laver Production Down

On May 28, Korea's Office of Fisheries arranged to export 4.8 million bundles of laver during April-September, although production had amounted to only 7.68 million bundles--less than half the 1968 total. Japan could buy only 3.63 million and, when prices were established on July 10, actually had imported only 2.53 million.

Shipment of the remaining 2.27 million bundles had been scheduled for early August but, because of poor production, only 1 to 2 million reportedly would be available.

Higher Prices Established in 1969

The new price average is 2,079 yen (US$5.78) a bundle, almost 700 yen above 1968. A bundle of high-grade laver is 2,310 yen (US$6.39), and low grade, 2,050 yen (US$5.69). About 90% is low grade.

The buying price for Japanese importers is 1,800 yen. They may add 250 yen a bundle--150 for import duty, 54 for commission, 4 for warehouse charges, 24 for interest--and deliver to the Laver Association at 2,050. The Association adds 7 yen a bundle before distribution to wholesalers.

Ministerial Discussion

The Koreans again brought up the subject of dried laver at the 3rd Japan-Korea Ministerial Conference in Tokyo, August 26-28. Korean demands were essentially the same as before--revision of import and marketing procedures. Japan's position remained unchanged, but she promised to reduce tariffs on some secondary marine products, and agreed to continue joint fisheries projects and to extend credit for fishery development.

JAPAN

PURSE SEINERS REPORT GOOD FISHING OFF WEST AFRICA

Nichiro's Fishing Company's purse-seine fleet off west Africa made good yellowfin and skipjack catches in July. The average was 13 tons a day per pair of seiners. The fleet included 5 pairs of seiners (two less than in 1968), and 2 refrigerated carriers, 'Haruna' (1,427 gross tons) and 'Chichibu Maru No. 2' (1,697 gross tons).

Insufficient Freezing Capacity

A problem was that the carriers have a combined freezing capacity of 100 tons a day and could not process all the catch. When fishing is good, the catch at times exceeds 100 tons.

This problem may worsen when a new 350-ton combination pole-and-line seiner joins the fleet in December. The vessel, now under construction in Japan, will cost about US$778,800. It will be equipped with a Norwegian power block. ('Shin Suisan Shimbun Sokuho,' July 18.)

* * *

NORTH PACIFIC WHALING IS SUCCESSFUL

The 1969 Japanese North Pacific whaling expedition ended August 4. The 3 mothership whaling fleets attained their assigned catch of 886.5 blue-whale units. Their combined output totaled 54,983 metric tons of processed products, about 1,200 tons more than planned. ('Nihon Suisan Shimbun,' Aug. 13.)

Production	'Nisshin Maru'	'Kyokuyo Maru No. 3'	'Tonan Maru'	Total
	(No. of Whales)			
Whales:				
Fin	186	192	198	576
Sei	1,155	1,317	1,119	3,591.
Blue-whale-units	285.5	315.5	285.5	886.5
	(Metric Tons)			
Products:				
Fin whale oil	4,015	4,378	4,190	12,583
Frozen products	12,094	14,261	12,927	39,282
Salted products	258.4	110	236.2	604.6
Meal	142	273	-	415
Solubles and others	1,988.6	-	20	2,008.6
Total	18,498.0	19,022.0	17,373.2	54,893.2

* * *

EASTERN PACIFIC SAURY FISHING IS DISAPPOINTING

The Taiyo, Nihon Suisan, and Nichiro fishing firms sent 6 vessels to the northeastern Pacific on an exploratory saury fishing cruise in July. The vessels are equipped to fish with stick-held dip nets or scoop nets. In early August, they reported the catch disappointing.

Off N. America

From July 22-31, Taiyo's 'Azuma Maru No. 6' (238 gross tons) worked off the North American coast from Vancouver to San Francisco. She found very light concentrations of saury and noted that their response to searchlights was poor.

Azuma Maru's primary objective was to study the abundance and distribution of saury as tuna bait. Licensed to fish until August 10, she cut her survey short because of stormy weather all along the Pacific coast. After a refueling stop at Terminal Island, Calif., she proceeded to eastern Pacific tuna and marlin grounds.

Trawlers South of Aleutians

Nihon Suisan's trawlers 'Shinano Maru' (539 gross tons) and 'Koshu Maru No. 8' (85 gross tons) fished near 40°-45° N. latitudes and 165°-175° E. longitudes, south of Aleutians, until late July. They found no sizable school. Attracting lights proved ineffective. The 2 trawlers, working together, had taken only about 7 tons of saury by the end of July. Later, they moved eastward to continue their search.

Trawlers Move Eastward

Two Nichiro trawlers, 'Akebono Maru No. 17' (499 gross tons) and 'Akebono Maru No. 21' (492 gross tons), proceeded eastward between parallels 41°-45° N. latitudes in early August. At that time, they had not encountered any significant concentrations.

Nichiro's third trawler, 'Akebono Maru No. 18,' 499 gross tons, was shrimp fishing in northern waters and had not begun saury fishing. ('Suisan Tsushin,' Aug. 5.)

* * *

JAPAN (Contd.):

BAIT SAURY SAMPLE SHIPPED FROM U.S.

The Federation of Japan Tuna Fishery Cooperative Associations (NIKKATSUREN) recently received a 6-pound sample shipment of saury taken by a U.S. vessel about 80 miles off San Francisco. The vessel had been exploring the commercial possibilities of the saury resource off California. The sample was similar to the saury taken off Japan--medium-size fish used as tuna bait.

Possible Export to Japan

In view of the poor fishery off Japan in recent years, and the consequent high prices, the U.S. is considering supplying the Japanese. However, NIKKATSUREN officials said that prospects of procuring bait saury from the U.S. do not look bright. Both the price and the quantity available are uncertain, and Japan still restricts imports. ('Suisan Keizai Shimbun,' Sept. 11.)

* * *

RESEARCH VESSEL FINDS PROMISING GROUNDS IN S. ATLANTIC

The tuna longliner 'Azuma Maru No. 37' (314 gross tons), searching for new tuna grounds in the South Atlantic since May 26, has found some promising albacore and big-eyed grounds. Near 33°-36°03' S. latitude and 50° W. longitude, she took 41 big-eyed (1,938 lbs.) and 216 albacore (9,504 lbs.). The government is paying half the exploratory-cruise expenses.

The vessel was scheduled to call at Buenos Aires, Argentina, August 4 to transship about 120 metric tons--80 tons of albacore and 40 tons of big-eyed.

To Fish Higher Latitudes

On the next leg, Azuma Maru was slated to seek southern bluefin in the higher latitudes near 45°-50° S. She is scheduled to return to Japan in March 1970. ('Suisancho Nippo,' July 22.)

* * *

ARTIFICIAL CULTIVATION OF TUNA WILL BE TRIED

The Japanese Fisheries Agency plans to try for commercial-use artificial cultivation of tuna. About 60 million yen (US$167,000) will be appropriated in fiscal year 1970 (April 1970-March 1971) for an experiment. It will be conducted by the Far Seas Fisheries Research Laboratory, Mie Prefectural Fisheries Research Station, and Tokai and Kinki Universities. Land owned by Tokai University, southwest of Tokyo, will be leased for use as the culture area.

The Experiment

Tuna will be reared from larval stage to maturity for about one year. Big-eyed is the primary species being considered. Bluefin requires 8 years to reach maturity, but big-eyed can be grown in one year to 50-60 centimeters, larger than cultured yellowtail. At that size, it can be used for "sashimi" (sliced fish served raw).

Potential Problems

While a tuna-seeding technique has been tried successfully in Japan, the Agency has cited potential problems in commercial cultivation. Tuna are deep-sea fish and may die if reared in a confined area--a tank, for example, where they might swim into the walls. While millions of eggs are released during spawning, the rate of survival for juvenile and adult stages is unknown. Temperature conforming to natural environment during spawning and rearing periods also may be difficult to control. Although tuna can be fed water fleas and brown shrimp, they are voracious eaters. This poses a question of their value as a commodity--the cost of feeding relative to growth. ('Shin Suisan Shimbun,' July 21.)

* * *

OWNERS HOPE TO IMPROVE TUNA PURSE SEINING IN EASTERN PACIFIC

Owners of 4 purse seiners that failed dismally in the eastern Pacific tuna fishery this year are seeking improved performances in 1970. The season opens January 1. Large vessels and speed boats may be used. The independently managed seiners may unify operations.

JAPAN (Contd.):

Late Arrivals in Eastern Pacific

The seiners landed only about 360 tons of yellowfin during the 1969 season. This disappointing performance has been attributed to their late entry. By the time they arrived, the yellowfin had left the coastal area and were associated with schools of fast-swimming porpoise. These schools travel too fast for the slow seiners. ('Katsuo-maguro,' Sept. 9.)

* * *

MORE FISHING VESSELS ARE EXPORTED

From 1965 through 1968, Japan exported 405 fishing vessels--219 draggers, 159 tuna vessels, and 27 purse seiners. She exported considerably more to S. Korea than to other countries.

Over three quarters went to 4 countries--185 to S. Korea, 66 to the Philippines, 38 to Taiwan, and 29 to the Ryukyus.

S. Korean Orders Rise

Applications for export of draggers to S. Korea have increased again this year because the latter wants to develop a pelagic fishery to earn foreign exchange.

Korean import restrictions are more strict this year; the import of fishing vessels more than 4-5 years old has been banned. No such restriction has been imposed by any other country, and exports to other countries will continue as before. ('Minato Shimbun,' July 6.)

* * *

SUPER TRAWLERS PLANNED

Four fishery firms--Nihon Suisan, Hokoku Suisan, Taiyo, and Tokushima Suisan--are planning to build 5,000-gross-ton trawlers to operate in northern waters in 1970. Two other major firms, Kyokuyo Hogei and Hoko Suisan, also are considering 5,000-ton trawlers.

Nihon Suisan has ordered a 40-ton daily capacity minced-meat plant and a 125-ton meal plant for its trawler. The other firms are planning similar installations.

Fish-Meal Production Boosted

Together with 'Taiyo Maru' (2,886 gross tons) and 'Akebono Maru No. 72' (3,500 gross tons), now being fitted with meal plants, such vessels would boost substantially Japan's 1970 factoryship production of minced meat, meal, and frozen products. ('Suisancho Nippo,' Aug. 5.)

* * *

NEW TUNA LONGLINER PERFORMS WELL

On July 13, the tuna longliner 'Yakushi Maru No. 38' (254 gross tons), a bulbous-bow, all-weather vessel built in early 1969, returned from a 141-day trip to the eastern Pacific. She brought back 176 metric tons of tuna (mostly big-eyed) taken near 4°-12° S. latitudes and 120° W. longitude, southwest of Clipperton Island.

Catch Brought High Prices

The catch, frozen aboard by a trolley-type, fish-hanging, and semi-air-blast-freezing system, retained a high degree of freshness and good meat quality. It brought high ex-vessel prices--averaging over 300 yen a kilogram (US$756 a short ton) at Shimizu.

Stable Craft

The vessel's stability was good and double-deck construction provided a safe working area. On July 24, she departed again for the eastern Pacific. The owners hope for annual earnings of over $611,000. ('Suisan Keizai Shimbun,' July 29.)

* * *

TWO MODERN TUNA LONGLINERS ORDERED

The Hoko Suisan Fishing Company recently ordered two 405-gross-ton, all-weather, tuna longliners for high-latitude operations from Usuki Shipyard. The advanced-design vessels will be equipped with modern installations, including a reel-type longline retriever and a freezing unit capable of very low temperatures. They should be completed by March 1970.

Specifications

The vessels' main specifications are: length 166 feet; breadth 29 feet; depth 13

JAPAN (Contd.):

feet; 1,600 hp. engines; 11.5 knots cruising speed; 6-ton daily freezing capacity with trolley-type fish hangers, and 1.5 tons in freezing trays; and 270 metric tons carrying capacity. They will carry 22-man crews. ('Minato Shimbun,' Sept. 7.)

* * *

FISHERIES AGENCY BUILDS 1,500-TON PURSE-SEINE RESEARCH VESSEL

The Fisheries Agency has decided to build a 1,500-gross-ton, purse-seine research vessel patterned after the large U.S. commercial seiner. The vessel will carry two 40-knot speedboats and search for skipjack and other surface tuna schools. This is intended to help the tuna fishery, which is in financial trouble because of declining longline catches. She also could be used to investigate other resources, such as saury, mackerel, and sardines.

The Vessel

The vessel will be 223 feet long, 46 feet broad, and 23 feet deep. Two 5,500-hp. main engines, coupled to controllable pitch propellers, will give a maximum speed of 18 knots. Other equipment will include a side thruster, a stabilizer, and a Norwegian power block. Construction is to be completed in 1971. ('Suisancho Nippo,' July 25 & 28.)

* * *

FROZEN TUNA COMMISSION SALES GROW

During Jan.-April 1969, member companies of the Frozen Food Exporters Assoc. exported 18,955 metric tons of frozen tuna caught by other countries. Japanese exports of frozen tuna for the same period were 20,610 tons.

The 18,955 tons handled through commission sales were taken mainly by Taiwanese and S. Korean fishing vessels; 12,672 tons were exported to the U.S., and 6,283 to Italy.

Yellowfin Is 60%

Yellowfin accounted for 11,312 tons--60% of total sales. Japanese yellowfin exports during the same period were 8,425 metric tons--20% below commission sales. Albacore accounted for 7,000 tons of total sales (Japanese exports were 8,795 tons); big-eyed 616 tons, and skipjack 584 tons.

Exports Unchanged

Japanese frozen tuna exports for same period 1968 were 39,138 tons. During first 4 months of 1969, Japanese exports were half the 1968 period's. However, when commission sales are added, the quantity exported remains the same. ('Suisan Tsushin,' July 5.)

* * *

FROZEN TUNA EXPORTS DIP IN FIRST-HALF 1969

Frozen tuna exports during January-June 1969 of 32,980 metric tons were down 37% from the 52,190 tons exported in same period 1968. Yellowfin exports declined 47% from same period 1968; albacore decreased 19%.

Main Importers

Principal importers were: U.S., 12,274 metric tons (19,239 in 1968); Puerto Rico, 7,654 (11,570); Italy, 5,965 (12,558); Malaysia, 1,866 (939); and American Samoa, 1,575 (3,366).

The 1969 exports are expected to total about 65,000-70,000 tons at the most, compared with 105,000 tons in 1968. ('Suisan Tsushin,' July 22.)

* * *

PREMIUM ON EXPORT CANNED TUNA INCREASED

On July 15, the Tokyo Canned Tuna Sales Co. announced an 11-14 U.S. cents-per-case premium increase on canned whitemeat tuna in brine for export to the U.S. The increase resulted from the depletion of the company's canned tuna stocks. It is not known whether all of the present stock will be sold under the new price.

Sold Half Stock

During the July 8-11 sales, the company offered about 200,000 cases and received buy-offers totaling 400,000 cases. It decided to sell half the stock initially, and to allocate the remainder according to the buyers' past

JAPAN (Contd.):

performance and quantity ordered during recent sales.

Further upward price adjustments may be made if buy-offers increase. The recent premium increase was strongly opposed by the trading firms. They claim the present monopolistic sales system must be eliminated to end such arbitrary practices. ('Suisan Tsushin,' July 17.)

New prices are:

Style and Can Size	Present Price 1/	Premium		
		Original	Additional	Total
	(US$/Case)			
Canned whitemeat tuna in brine:				
Solid: 7-oz. 48's	11.11	0.28	0.14	0.42
13-oz. 24's	10.33	0.28	0.14	0.42
3½-oz. 48's	6.66	0.17	0.11	0.28
6½-oz. 6's	12.33	0.42	0.14	0.56
6.6-lb. 6's	21.17	0.83	0.14	0.97
Flake: 6½-oz. 48's	8.11	0.20	0.11	0.31
Chunk: 6.6-lb. 6's	18.94	0.56	0.14	0.70

1/Exwarehouse, Shimizu, Japan.

* * *

CANNED TUNA IN OIL EXPORTS DECLINE

Canned tuna in oil exports, January-June 1969, were 4,680,764 pounds valued at US$2,016,500; these were sharply below comparable 1968 exports of 15,910,088 pounds worth $4,976,900.

The decline was due to short supplies of skipjack (the principal species used for canned tuna in oil) and higher export prices. ('Katsuo-maguro Tsushin,' Aug. 11.)

* * *

FROZEN SHRIMP IMPORTS CONTINUED HIGH IN JUNE

Japan imported 4,122 metric tons of frozen shrimp worth US$11 million in June, surpassing the 4,000-ton mark for the 3rd straight month. Imports in June 1968 were 2,324 tons.

The imports were reported to have increased frozen-shrimp holdings to around 1½ months' supply, depressing prices for smaller-sized shrimp on domestic market.

The principal suppliers during June were: Australia, 526 metric tons; Hong Kong, 440; Thailand, 404; Mexico, 397; and Communist China, 366. ('Suisancho Nippo,' July 17.)

* * *

IMPORT RESTRICTIONS LIFTED ON SMOKED SCALLOPS & SQUID

The government has decided to reduce the number of commodities on the residual import restriction list from 120 to 60. Smoked scallops and smoked squid, now under import quotas, definitely will be decontrolled.

Fresh and frozen yellowtail, jack mackerel, Pacific mackerel, saury, sardine, cod, herring, squid, and scallops, salted cod and herring roes, dried laver, and marine-animal meal and scraps will remain on the list. ('Suisan Tsushin,' Sept. 22.)

* * *

YAIZU LANDINGS ROSE IN AUGUST

Landings at Yaizu in August of 7,792 metric tons (worth about US$4.6 million) were 118 tons over the 7,674 ($4.4 million) landed in August 1968. Bluefin and albacore landings were down but good skipjack fishing off Japan in August resulted in sharply increased landings compared with the same month last year. ('Kanzume Tokuho,' Sept. 4, 1969.)

Landing and Average Exvessel Prices, July-August 1969 & July 1968

	Quantity			Average Price		
	1969		1968	1969		1968
	Aug.	July	Aug.	Aug.	July	Aug.
	(Metric Tons)			(US$/Short Ton)		
Tuna:						
Bluefin 1/	2,708	3,267	4,004	975	849	736
Albacore	187	780	306	489	434	436
Skipjack	4,266	8,291	2,848	287	262	250
Mackerel	89	38	25	144	131	192
Others	542	448	491			
Total	7,792	12,824	7,674			

1/Includes yellowfin and big-eyed tuna.

* * *

JAPAN (Contd.):

SHRIMP TEAMS VISIT
SOUTHEAST ASIA & LATIN AMERICA

The Japan Fish Products Import Assoc. plans to send a shrimp team on a government-subsidized trip to Pakistan, India, and Thailand. The team will survey local shrimp fishing, processing, and marketing; it will advise on quality control and sanitation. This will facilitate Japanese imports of frozen shrimp from the 3 countries.

In 1967 and 1968, the association sent similar missions to southeast Asia and the mid-East. As a result, shrimp purchases from those areas have increased sharply.

Other Visits Planned

The association also plans to send a shrimp mission on a 45-day trip to 12 Latin American countries--Brazil, Surinam, Guyana, Trinidad, Tobago, Barbados, Venezuela, Colombia, Panama, Costa Rica, El Salvador, and Mexico. ('Suisan Keizai Shimbun,' July 17.)

* * *

JAPANESE-MAURITANIAN
FISHERY TALKS FAIL AGAIN

Negotiations to allow Japanese trawlers to fish inside Mauritania's 12-mile fishery zone were broken off for a third time this June. Japan had offered to pay entry fees according to the quantity of catch, but Mauritania wanted assessments based on vessel tonnage.

Since the difference between the two methods of assessment--against 69 Japanese vessels trawling off west Africa--would amount to US$1.9 million, the Japanese would not accept Mauritania's proposal. ('Suisan Keizai Shimbun,' June 24.)

INDIA

VESSEL MAKES RECORD LOBSTER CATCH

According to a report from Cochin, an Indo-Norwegian project deep-sea fishing operation made a record catch of spiny lobsters off Quillon recently. On a 2-day cruise, the fishing vessel 'Klaus Sunnana' caught up to 5 metric tons of lobsters in only 14 hours of fishing.

Fairly Large Quantities Found

A survey of the coast from north of Trivendrum to Cannanore has indicated fairly large quantities of shrimp and spiny lobster in 100 to 250 fathoms. Intensive fishing has been carried out in some of the grounds to find out their commercial possibilities. ('World Fishing,' London, July 1969.)

CEYLON

FIRST FISH CANNERY IS OPERATING

Ceylon's first fish-packing plant, 'Sesalai,' began operations on August 5. Built for about US$382,500, it employs 100 workers. The cannery capacity, which is about 28,000 cans per 8-hour day, packs small fish taken in coastal waters. Tuna will be canned in the future. ('Suisancho Nippo,' August 21.)

INDONESIA

FROZEN SHRIMP EXPORTS
ARE DEVELOPING

Shrimp could become an important export commodity for Indonesia. Already it is a commercial catch along the east coast of Sumatra and the north coast of Java. But along the muddy coasts of Kalimantan (South Borneo) and West Irian (western New Guinea), it is practically untouched.

Because proper collection facilities have been lacking, shrimp has never been major export item, with one exception: Requiring practically no more effort for foreign than for domestic sale, it is shipped in ice from some parts of Sumatra to Malaysia and Singapore.

Exports began in 1967, when exporters in Djakarta first succeeded in collecting standard sizes in sufficient quantities. Since then, frozen shrimp exporting has begun in other areas, for example, Central Java and North Sumatra.

INDONESIA (Contd.):

Fishing Areas & Supplies

Most of the export shrimp comes from the existing small fishing operations, but increasing competition has impelled some exporters to set up their own operations. Djakarta's supplies generally come from the Bay of Djakarta, Tjirebon, West Java, and Tjilatjap in Central Java.

Fishing Methods

The local fishermen use primitive gear--beach seines, push nets, or traps. Nylon gillnets have been introduced in Tjirebon, and their popularity is increasing rapidly. Trawling is still experimental, except in North Sumatra, where it is already a commercial operation. Most of the shrimp supplied to Djakarta is Penaeus merguiensis mixed with other varieties, such as tiger prawn P. monodon.

Handling & Transportation

The fishing grounds are so close to the landing places that shrimp usually are landed un-iced. As soon as landed, they are collected by the exporters, usually through intermediaries buying only the exportable sizes. Handling facilities are provided by the exporters. The shrimp are beheaded, washed, packed in ice in cases or baskets, and trucked to Djakarta. The 6-10 hour trips are made at night to avoid excessive heat.

Processing, Freezing & Cold Storage

After arriving at the Djakarta processing plants, the shrimp are dumped into washing tanks. Some processors ice the washing water to keep temperatures down. If the shrimp are heads-on, they are first beheaded; then, after being thoroughly washed, they are graded according to quality, species, and size. Each category is weighed into 2.2 kilogram (5 lbs.) lots and distributed to the packing tables. They are arranged in rectangular metal pans covered with perforated metal lids. After water has been poured through the holes into the pans, they are frozen at -20° C. (-4° F.) for 8-12 hours. After the frozen blocks are removed from the pans, each is placed in a plastic bag, and then in a carton. Six cartons go into one 13.6 kilogram (30 lbs.) masterbox. These go in cold-storage to await final sea or air shipment to Singapore, Hong Kong, Japan, and the U.S.

Quality Control

Fishery products for export, including shrimp, are inspected by government agents shortly before shipment. A certificate of quality is issued for those found fit for human consumption. They are graded "Excellent," "Good," "Fair," and "Poor," ratings roughly equivalent to "U.S. Grade A," "U.S. Grade B," "U.S. Grade C," and "Sub-Standard."

Future Developments

To export frozen shrimp requires freezing and cold-storage facilities. Such facilities still are underdeveloped in Indonesia, forcing shrimp exporters to establish new freezing and cold-storage plants. These indirectly benefit the whole fish-processing industry. The rush for exportable shrimp also has opened new shrimp fishing opportunities--development of more efficient fishing gear and methods, and exploration of new fishing grounds.

The participation of new private enterprises is also very important to the industry. Formerly, private enterprise was very reluctant to invest capital in the shrimp fishery.

(Text based on a note submitted to 13th Session of the Indo-Pacific Fisheries Council, Australia, Oct. 1958, by Soenjoto Darmaredjo, Institute of Fisheries Technology, Pasar Minguei, Djakarta.)

SOUTH PACIFIC

AUSTRALIA

INTENSIVE SHRIMP RESEARCH PROGRAM TO BEGIN

Australia has announced a major research program on shrimp to be undertaken by the Commonwealth Scientific and Industrial Research Organization (CSIRO). The ultimate objective is the fullest exploitation of the northern shrimp fisheries consistent with conservation. It will involve about A$600,000 in capital expenditure over 3 years and, when in full operation, a recurrent yearly expenditure of about $330,000.

Gulf of Carpentaria Shrimp Fishery

Six years ago, the Commonwealth, the Queensland government, and commercial fishermen began the investigations that led to the discovery of great quantities of shrimp in the southeastern Gulf of Carpentaria. Commercial exploitation, first by Australian and later by foreign fleets, soon produced an annual harvest of millions of pounds.

Catch Decreased in 1968

After a record catch in 1968, the yield decreased considerably in 1969. Reasons for the decrease are unknown, but some other countries also reported a bad season. Only a carefully planned research program can determine the true cause of such dramatic fluctuations. More must be learned about the factors influencing population size, particularly the rate of natural replenishment and the impact of commercial fishing.

CSIRO's Program

CSIRO will begin with a size and age composition study of individual and collective shrimp catches. Individual specimens will be tagged to chart movements to and from the fishing grounds. Oceanographic researchers will study the effects of ocean currents and seawater changes on migration in different areas and seasons. Species studies will include investigations of growth, reproduction, behavior, the factors influencing food supplies, and the effect of different fishing intensities. ('Australian Fisheries,' July 1969.)

* * *

SETS UP FISHERIES RESEARCH FUND

Australia is establishing a Commonwealth Fishing Industry Research Trust Account similar to the ones for the wheat, wool, dairy, meat, tobacco, and egg industries. The initial annual Commonwealth contribution will be about A$500,000. Each State will name its own trust fund to receive industry contributions for fisheries research within the State.

Advisory Committee

A Fishing Industry Research Committee--one representative from the Department of Primary Industry, one from the Commonwealth Scientific and Industrial Research Organization (CSIRO), and one from the Fishing Industry Council--will advise the Minister for Primary Industry on expenditures from the account.

Some programs the fund might support are: biological research--distribution, behavior, sustainable yields--and fishing regimes for particular stocks; technological research to improve exploiting, handling, and processing methods; economic and market research; extension of research results to the industry; vocational training and technical education. Each one would contribute to overall fisheries development. The fund also would support direct development projects: for example, demonstrating prototype equipment, exploratory fishing, and developing new products.

Scope of Fund

Any type of program connected with the fund's purposes will be considered. Fund money will be spent for the benefit of the Australian fishing industry as a whole, rather than for a particular section. The fund will not be used to finance purchases of plants and facilities, nor will it finance projects in the external territories. ('Australian Fisheries,' July 1969.)

AMERICAN SAMOA

TUNA PRICES UNCHANGED IN SEPTEMBER

September tuna prices in American Samoa carried over from August: $430 a short ton for frozen round albacore, $415 iced; $347.50 for frozen gilled-and-gutted yellowfin, $327.50 iced. ('Katsuo-maguro Tsushin,' Sept. 4.)

AFRICA

SOUTH-WEST AFRICA

STRICTER CONSERVATION MEASURES ANNOUNCED

A South-West African government official has announced stricter conservation measures for fish resources, including a closed season from November 1, 1969, to January 31, 1970. Beginning in fall 1970, the closed season will run from the end of October to the beginning of February of the following year.

He also warned vessels encroaching on the 12-mile fishing limits that patrol services will be strengthened.

The government also has decided to tighten spiny lobster catch limits. ('The South African Shipping News and Fishing Industry Review,' Sept. 1969.)

SOUTH & SOUTH-WEST AFRICA

FISH OIL PRODUCTION & EXPORTS, FIRST-HALF 1968-1969

	PRODUCTION		EXPORTS	
	1968	1969	1968	1969
	(Metric Tons)			
January	5,187	2,537	14,446	-
February	9,258	9,211	4,293	6,101
March	14,008	9,101	5,012	-
April	15,069	13,027	2,280	19,413
May	16,812	14,917	16,000	3,378
June	18,114	21,067	18,289	6,488
Total	78,448	69,860	60,320	35,380

(Source: U.S. Consul, Cape Town; South African Fish Meal Producers' Association.)

SOUTH AFRICA

SOUTH AFRICAN COMPANY ENTERS ANGOLAN FISHING INDUSTRY

A South African company, Pescangol (Pty.) Ltd., is planning to develop a small uneconomic Angolan fish-meal factory into a profitable operation. Through an Angolan subsidiary, Investimentos Sul Africanos de Angola, the company has bought a 75% interest in the ailing Unipesca S.A.R.L. Pescagnol agreed to pay about US$71,000 demanded by Unipesca's bankers, reducing its overdraft by one third.

Previous S. African Ventures

Pescangol now will have what promises to be a lucrative share in the underdeveloped, but potentially rich, Angolan fishing industry. The industry has tempted South Africans before. Several were forced to drop plans for Angolan subsidiaries some years ago after Portuguese legislation prohibited foreign control of Angolan fishing ventures.

Pescangol seems to have found a loophole: a group of South-West African farmers obtained a 90% interest in Unipesca just a few months before the law. They converted the company from trawl to shoal fishing, and installed an old 7-ton-an-hour fish-meal plant. These changes were insufficient for a profitable operation, and debts began to mount. This opened way for Pescangol's take-over.

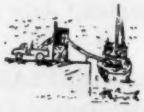
To Renovate Company

Pescangol will replace 3 shoal-fishing boats with 70-80 vessels now on order from a Luanda boat builder. All boats will be fitted with radios, still new to Angolan vessels, power blocks, and echo-sounders.

Pescangol also plans to build a 30-ton-an-hour fish-meal plant; one quotation has been received from a Norwegian manufacturer. Unipesca already has its own jetty. The fish will be unloaded by pump.

To Expand Production

After the plant is commissioned in 1970, raw-fish intake should rise to 40,000 metric tons; 26,000 tons are planned this year. Unipesca has averaged only 15,000-18,000 tons since 1965. ('The South African Shipping News and Fishing Industry Review,' Sept. 1969.)



CATFISH

Whoever heard of fish that feed themselves? A major food company now markets a mechanical feeder that catfish trip when they get hungry. It's all part of the South's newest industry--catfish farming!

According to Dr. Jack Greenfield, Industrial Economist with BCF Ann Arbor, Michigan, about 12 million pounds of farm-raised catfish worth $4.6 million were harvested during 1968. Production in 1969 may be double, he says; by 1972 it could be 52 million pounds. Catfish are being grown in 25,000 acres of ponds. Mississippi (9,000), Arkansas (7,600), and Louisiana (2,700) lead in acreage and production.

Fig. 1 - Just about market size, this catfish soon will be on its way to a catfish-processing plant. BCF has developed a full-color cookbooklet called "Fancy Catfish," available from Government Printing Office. (Photo: Arkansas Game and Fish Commission)

The Catfish Market

Walter Jones, Regional Marketing Coordinator at BCF Ann Arbor, reports that most of the 1968 catfish were marketed locally as live or dressed fish to fish markets, individuals, and restaurants. Some catfish also were marketed as live fish to operators of pay-fishing lakes. The markets are changing rapidly, however. This year, there are at least 5 plants in the South processing catfish into a dressed, frozen product for distribution to restaurants, supermarkets, and other outlets throughout the U.S. Several franchised restaurants specializing in catfish also have been opened.

BCF is providing technical assistance and information on plant design and sanitation for new processing plants.

Fig. 2 - Catfish farms now form geometric patterns across the Southern United States.

Grown in Ponds

Jim Ayers, BCF Fishery Marketing Specialist, Little Rock, Arkansas, explains that most catfish are grown in ponds ranging from a few acres to 40 acres or more. Ponds are filled with 3 to 6 feet of water and stocked with 1,000 to 1,600 fingerling catfish per acre. They are fed a pelleted feed (many companies market commercial catfish feeds) for a year or more until they reach the popular market size of 1 to 1½ pounds. Production per acre ranges from 1,000 to 2,000 pounds and averages about 1,400 pounds. Although several species of catfish are being grown, the most popular is the channel catfish (Ictalurus punctatus).

Fig. 3 - Everyone wades in to load catch after BCF biologists give a catfish-harvesting demonstration. At Bureau's Gear Research Base in Kelso, Arkansas, biologists are searching for quicker, more efficient methods of harvesting.

A big problem is harvesting the fish, says Don Greenland, BCF Gear Research Base in Kelso, Arkansas. A Base-developed mechanized haul seine harvests effectively many catfish ponds. He says that one of the Base's primary objectives is to improve and modernize harvesting methods. BCF demonstrations are given throughout "catfish country" to familiarize farmers with techniques and gear. The results are good: Several farmers have obtained similar gear.

Why Catfish?

Why are farmers converting some acreage to catfish farming? Catfish are popular in the South for their excellent eating qualities, says Walter Jones. More important, catfish can produce profits equal to, or higher than, soybeans, cotton, or rice; they are worth more per pound (35¢ to 45¢ and higher) than cattle, pork, or poultry. Demand also has been good.

With all the interest in catfish farming, a new organization, Catfish Farmers of America (CFA), was formed to bring order and unity to the industry. The CFA drew up stringent guidelines for their members. "Quality and continuity of supply are our watchwords," says President Charles Pickering. The organization has asked BCF to develop quality control standards.

The prospects for fish farming are good. As farmers gain experience and try new methods, greater efficiency and lower product costs will be realized. Many species of fish and shellfish can be grown successfully in fresh or saltwater ponds. The potential for diversification is excellent. Genetic breeding for faster-growing and more meaty fish offers new possibilities.

Problems May Develop

The future is not cloudless. Overexpansion and overproduction are definite possibilities during the next few years. Although BCF marketing specialists are trying to introduce catfish in other areas, the catfish image outside the South is not always good--and may not be changed easily. Some resistance also is being encountered to present prices of farm-grown catfish. Competition from foreign and cheaper production along the Gulf Coast may occur.

BCF is working with the industry to overcome the problems. Some of its specialists believe the catfish farming industry will become a significant new source of fishery products for U.S. consumers. (National Marketing Services Office, Bureau of Commercial Fisheries, United States Department of the Interior, 100 East Ohio Street, Room 526, Chicago, Illinois 60611.)

THE WAY OF ALL GIANTS?

A century ago lobsters sold for 2¢ a pound and were so common they were sometimes used as fish bait. Better transportation and refrigeration have drastically changed this, and fishing pressure has become intense. Dockside prices for lobsters are 80¢ a pound or more.

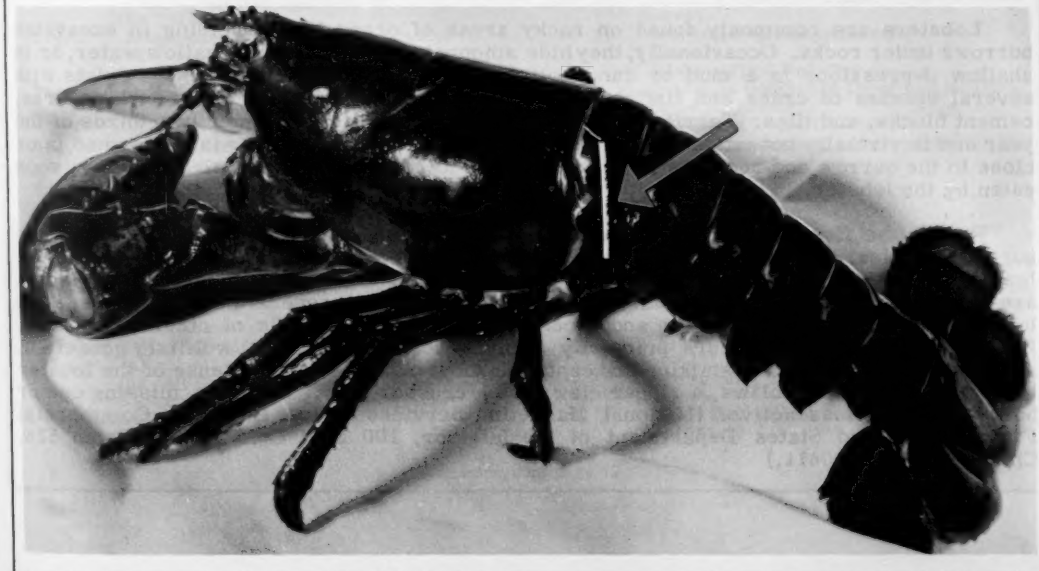
Vessels are now fishing in the deep offshore waters, where giant 20-30 pound lobsters are found, according to Bernie Skud, Director of the BCF Biological Laboratory in Boothbay Harbor, Maine. The offshore catch used to be less than one percent of the total lobster catch. Now, however, the offshore fishery is growing rapidly; it provides almost a fifth of the U.S. catch. Although the inshore fishery of New England still produces most of the world's supply, BCF, as early as 1965, became concerned that the two fisheries might be competing for the same supply of lobsters. Like any other crop, the lobster has an upper limit of harvest; go beyond that limit and everyone suffers--fishermen, processors, and the consumer.

Coastal & Offshore Fisheries Compete?

To determine if the coastal and offshore fisheries do compete for the same supply of lobsters, BCF established an intense research program at its Boothbay Harbor Laboratory. The program had several objectives. One was to establish a management plan for each fishery to secure the maximum catch possible without jeopardizing the lobster fishery. Another was to study the possibility of lobster farming. Skud says: "We think, on a high-priced product such as lobsters, that a company could farm them, make a nice profit, and still not compete with the commercial fishery. The supply to the consumer would, of course, also be increased; who knows, maybe we could all afford to eat lobsters."

Tagging Studies

To study the movements and interchange of lobsters in the inshore and offshore fisheries, BCF began a series of tagging studies. The early tags were attached directly to the armor-like shell-covering. However, these tags were lost when the lobster moulted. A small, harmless, yellow tag, retained through moulting, was developed later by Bureau scientists.



A small, harmless, yellow tag is used by BCF biologists to determine movements of lobsters on inshore and offshore fishing grounds. Through research, the biologists hope to develop a tag that stays attached even when the lobster casts its shell. These studies will provide data necessary to properly manage the important lobster fishery.

Since 1966, nearly 10,000 lobsters have geen tagged and released on the coastal and offshore fishing grounds. Those recaptured by fishermen showed that lobsters in the coastal areas remained in their chosen territories; in the offshore areas, however, lobsters moved long distances: one-third of those tagged moved over 50 miles, and one lobster traveled 185 miles in 70 days!

These tagging studies will soon tell BCF scientists whether the offshore fishery can be expanded without hurting the inshore fishery. "If we can, it will mean more lobsters for the fishermen and for the consumer," explains Skud. "Further development and added fishing pressure will undoubtedly spell the end of the giant lobster era. But that is inevitable in any productive fishery--and is the way of all giants."

Other research designed to preserve the multimillion dollar industry includes an analysis of the yearly growth of the offshore fishery; studies of the structure, growth, blood, and tissues of lobsters to learn whether separate groups inhabit the different fishing areas; and oceanographic studies to help determine what the lobster requires of its environment. An artificial reef was also constructed; BCF SCUBA divers have made new observations about lobster behavior.

Lobster History

The American lobster is called Homarus americanus to distinguish it from all other species, variously known as spiny lobster, langusta, and rock lobster. In 1968, for the first time, it provided the U.S. with the world's most valuable lobster fishery.

An organized fishery for lobsters began in Eastport, Maine, in 1843, when the canning process was developed. Most of the product was exported. The fishery was carried out among the rocks and ledges of the New England coast; the lobsters were caught in traps resembling orange-crates. Today, the traps are much the same as they were then, but the dories and pea-pods have given way to power boats.

Lobster Habits

Lobsters are commonly found on rocky areas of ocean bottom, hiding in excavated burrows under rocks. Occasionally, they hide amongst attached algae in shallow water, or in shallow depressions in a mud or sand bottom. Competition for hiding places exists with several species of crabs and finfish. Lobsters will utilize artificial cover such as tires, cement blocks, and tiles. Territoriality is practiced during the warmer two-thirds of the year and is virtually nonexistent during the winter. The act of shedding is performed in or close to the burrow and requires 10 to 20 minutes to complete. The cast-off shell is soon eaten by the lobster.

During the first several years of life, lobsters spend most of their time within the burrow complex. At age 3 or 4, the lobster begins to roam over the ocean bottom at night, leaving the burrow at sundown and returning before sunrise. These nocturnal movements are in search of food and generally do not cover more than several hundred yards. The lobster eats practically anything and, occasionally, eats the shells of other organisms. Predation on the lobster occurs primarily at night; sculpins, cunners, wolffish, goosefish, and cod have been observed stalking and capturing lobsters. The main defense of the lobster is his relatively large claws, a ripper claw, and a crusher claw. Lobsters missing one or both claws are less active. (National Marketing Services Office, Bureau of Commercial Fisheries, United States Department of the Interior, 100 East Ohio Street, Room 526, Chicago, Illinois 60611.)

INDEX

Page

UNITED STATES:

1 .. Program To Strengthen U.S. Marine-Science Activities Is Announced
4 .. Wenk Comments on 5-Point Program
6 .. Hickel Urges World Action To Protect & Develop Arctic Resources
6 .. Interior Department Limits Fishery Loans To $40,000
6 .. Eastern Pacific Yellowfin Tuna Catch Rate Is Changed
7 .. The Shrimp Situation
8 .. Gulf Menhaden Fishery Sets Record
8 .. Management of Menhaden Fishery Is Suggested
8 .. Alewife Die-Off in Great Lakes Is Minor
9 .. Underwater Tuna School Tracked by Sonar
10 .. East Coast Clam Dredge Tested Off Oregon
11 .. Destroyer's Sonar Tracks Whale
11 .. University Curricula In Marine Sciences Published
12 .. U.S. Aids Gulf of Mexico Oyster Industry
12 .. Sensor Studies Temperature-Fish Migration Relationship
15 .. Soviet Research Vessel Arrives At Woods Hole
16 .. Foreign Fishing Off U.S., September 1969

States:

Alaska:

19 .. 1969 Salmon Pack Is Nearly Million Cases Below 1968's
19 .. Largest Bristol Bay Run Predicted for 1970
20 .. Fishery Economics Has Some Bright Spots
20 .. State Insurance Director Urges Fishermen's Co-Op
21 .. BCF Helps Cousteau Prepare Salmon Film

California:

21 .. To Build First State-Owned Channel Catfish Hatchery
22 .. Tagged Sturgeon Migrate Far

New York:

22 .. Long Island Sound Pollution Doubles in Decade

Washington:

23 .. Hake Landings in Puget Sound Reach 9 Million Pounds

Florida:

23 .. Shrimp Farming Study Wins EDA Funds

Commonwealth of Puerto Rico:

23 .. 'Stahl' Finds Snappers & Groupers in Unexploited Area Off Puerto Rico

ARTICLES:

24 .. A Trawler's Voyage Points Up U.S. Fishermen's Problems, by Elliot Carlson
27 .. Tuna Purse Seine Fishery in Eastern Tropical Atlantic, by John P. Wise
29 .. Fishery Oceanography--IV, Ocean Salinity and Distribution of Pacific Salmon, by Felix Favorite
33 .. Tropical Atlantic Tuna Larvae Collected During EQUALANT Surveys, by William J. Richards
38 ..BOOKS

Page

INTERNATIONAL:

41 .. FAO Holds Conference To Spur Fishery Investments
42 .. Hormones Stimulate Fish Growth
43 .. French Tag Tuna in Eastern Atlantic
43 .. 3 Nations Survey Barents Sea
43 .. Japan and South Korea Plan Joint Venture

Canada:

44 .. Pair Seine Netting Proves Great Success
44 .. Fisheries Minister Proposes Stricter Salmon Licensing in British Columbia
45 .. Newfoundland Landings in First-Half 1969
46 .. Government Buys Salt Cod for Foreign Relief
46 .. Conference on Automation & Mechanization Slated
46 .. October Was Fish Promotion Month

Europe:

USSR:

47 .. Proposes Dam To Protect Azov Sea
47 .. Deep-Water Trawling Takes Antarctic Cod
47 .. Vessel Seeks Shrimp Off Africa
48 .. Carp and Pike Bred in Reservoirs Supplied With Thermal Water
48 .. Artificial Culture of Sea Cucumbers & Scallops Begins
48 .. Bathyscaphe Used To Study Behavior of Fish in Trawl Nets
48 .. Finds Japanese Acoustical Devices Unsatisfactory
48 .. Purse Seining With Electric Lights May Be Developed
49 .. Fisheries Minister Promotes 'Minced Fish'

Denmark:

49 .. First-Half 1969 Landings Drop Below 1968 Record Period
49 .. Faroese Catch Declines Further
50 .. High-Seas Salmon Fishing Increases
50 .. Minimum Prices To Be Established

Norway:

51 .. Brisling Catch Is Smaller Than Expected

Iceland:

51 .. Increases Salmon Hatchery

France:

51 .. Fishing Fleet Dwindles
51 .. Subsidies Granted to Dried Cod Industry

United Kingdom:

52 .. Dogfish Is Becoming Popular
52 .. White Fish Authority Raises Interest Rate

Greece:

52 .. Foreign Trade Trends

Latin America:

Mexico:

53 .. Fisheries Declined in First-Half 1969
53 .. Decline Expected in West Coast Shrimp Fishery
53 .. Shrimp Research Conducted on West Coast
54 .. Shrimp Vessels To Get New Refrigeration Plants in U.K.
54 .. Fish Meal Plant and Sardine Cannery Are Built in Guaymas
54 .. Veracruz Fisheries

Peru:

55 .. Fish Meal Output & Exports, Jan.-July 1967-69

Index continued page 72.

INDEX (CONTINUED)

Page

INTERNATIONAL (Contd.):
Latin America (Contd.):
Ecuador:
56 .. Tuna Production & Exports Declined in 1968
56 .. 1968 Shrimp Catch & Exports Set Records
Asia:
57 .. Korea Raises Issue of Japan's Import Restrictions
Japan:
58 .. Purse Seiners Report Good Fishing Off West Africa
58 .. North Pacific Whaling Is Successful
58 .. Eastern Pacific Saury Fishing Is Disappointing
59 .. Bait Saury Sample Shipped From U.S.
59 .. Research Vessel Finds Promising Grounds in S. Atlantic
59 .. Artificial Cultivation of Tuna Will Be Tried
59 .. Owners Hope To Improve Tuna Purse Seining in Eastern Pacific
60 .. More Fishing Vessels Are Exported
60 .. Super Trawlers Planned
60 .. New Tuna Longliner Performs Well
60 .. Two Modern Tuna Longliners Ordered
61 .. Fisheries Agency Builds 1,500-Ton Purse-Seine Research Vessel
61 .. Frozen Tuna Commission Sales Grow
61 .. Frozen Tuna Exports Dip In First-Half 1969
61 .. Premium on Export Canned Tuna Increased
62 .. Canned Tuna In Oil Exports Decline

Page

INTERNATIONAL (Contd.):
Asia (Contd.):
Japan (Contd.):
62 .. Frozen Shrimp Imports Continued High in June
62 .. Import Restrictions Lifted on Smoked Scallops & Squid
62 .. Yaizu Landings Rose in August
63 .. Shrimp Teams Visit Southeast Asia & Latin America
63 .. Japanese-Mauritanian Fishery Talks Fail Again
India:
63 .. Vessel Makes Record Lobster Catch
Ceylon:
63 .. First Fish Cannery Is Operating
Indonesia:
63 .. Frozen Shrimp Exports Are Developing
South Pacific:
Australia:
65 .. Intensive Shrimp Research Program to Begin
65 .. Sets Up Fisheries Research Fund
American Samoa:
65 .. Tuna Prices Unchanged in September
Africa:
South-West Africa:
66 .. Stricter Conservation Measures Announced
South & South-West Africa:
66 .. Fish Oil Production & Exports, First-Half 1968-1969
South Africa:
66 .. South African Company Enters Angolan Fishing Industry
71 . .INDEX

HOW DEEP HAS A SKIN DIVER GONE?

The greatest depth to which a diver has ever descended without a pressure suit was reached in December 1962 when Hannes Keller, a Swiss mathematician, and Peter Small, a British journalist, descended to 1,000 feet in an open diving bell. At that depth, Keller swam outside for 3 minutes. He breathed a secret mixture of gases which was based on his own computations of what the human system requires and can tolerate; he also computed the decompression stages for the diver. Unfortunately, Small and another diver died during this attempt.

The deepest dive without breathing aids, mask, or fins was made in February 1967 by Robert Croft, a U.S. Navy submarine escape instructor. He carried a 29-pound weight and reached a depth of 212.7 feet. His unusual ability can be attributed to the fact that he had rickets in his childhood, which resulted in a flexible rib cage and a lung capacity about twice the normal. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

☆U. S. GOVERNMENT PRINTING OFFICE : 1969 392-623/4

UNITED STATES DEPARTMENT OF THE INTERIOR

Walter J. Hickel, *Secretary*
Russell E. Train, *Under Secretary*
Leslie L. Glasgow, *Assistant Secretary*
for Fish and Wildlife, Parks, and Marine Resources
Charles H. Meacham, *Commissioner*, U.S. FISH AND WILDLIFE SERVICE
Dayton L. Alverson, Acting Director, BUREAU OF COMMERCIAL FISHERIES

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

BACK COVER: A cloud of rainbow trout streams from plane passing 300 feet above Wahweap Bay on Lake Powell, Colorado. (Photo: Mel Davis)